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Self-Acting Car Couplers.

The coupling of cars need not always be effected by the use of a link and pins, but it must be remembered, says the *Railroad Gazette*, that in attaching cars together they must be entirely free, within certain limits, to move up or down or laterally, otherwise the attachments or the cars themselves will be broken. As there are very few mechanical devices which will furnish a secure attachment in one direction, and will yet allow this freedom of movement in others, it will be seen that if the simplest one of them is abandoned a new set of difficulties is encountered.

Now, besides all these, it must also be taken into consideration that the cars to which self-coupling arrangements must be attached vary very much in their construction. The height of their drawbars is not uniform, and their form differs more than their height. In the case of the machine for picking up screws, the latter were all exactly alike, whereas if they had been of different sizes and shapes the difficulty of handling them by an automatic machine would have been immensely increased.

It will be seen, then, that the problem of making a self-coupler, instead of being a very simple one, is in reality very complicated. In addition to this, the fact that the thousand or more inventors who have been engaged in attempts at producing a really practicable self-coupler are, the great majority of them, inexperienced mechanics, have no knowledge of drawing, which is the language of invention, and probably never coupled a car in their lives—when all these considerations are taken in mind, it will be apparent that there is no cause for surprise that nearly, if not quite, all of their work has been ineffective.

If there were a rule in the Patent Office that no application for a patent for a self-coupler would be received unless the inventor would first give proper evidence that he had been engaged for three months in coupling cars, there would then certainly be fewer applications received, and there is no doubt that those sent in would describe inventions of more merit than is possessed by those which are received now. As coupling cars is a dangerous occupation, there would, with such a regulation, probably be fewer inventors of car couplers left alive—a result which, we are inclined to believe, many railroad officers and some editors of railroad newspapers would not regret.

Speaking seriously, however, if inventors would direct their attention more to devices by which cars could be coupled without its being necessary for a person to go between them, they would probably accomplish more than they have thus far. If, too, car builders would take steps to construct their cars so that a person in between them would be secure from accident and injury, they would do more to preserve lives and limbs than they will by dreaming over self-coupling expedients, although, doubtless, such arrangements, if practicable, are very much to be desired.

Preparation of Oxalic Acid from Parchment Paper.

The waste left after the manufacture of ordinary paper are, as is well known, reutilized for paper making, but the raw material which is used for the fabrication of parchment paper always furnishes after the sulphuric acid treatment a considerable quantity of refuse residue not fit for paper making nor yet suitable as a combustible. As however, the parchment paper is made from pure rags, Mr. C. O. Cech, in *Dingler's Journal*, proposes to use this waste material after lixiviation in caustic potash for the preparation of oxalic acid, for which he considers it better than sawdust or beet pulp.

VERTICAL COMPOUND ENGINE WITH ALLISON'S BOILER.

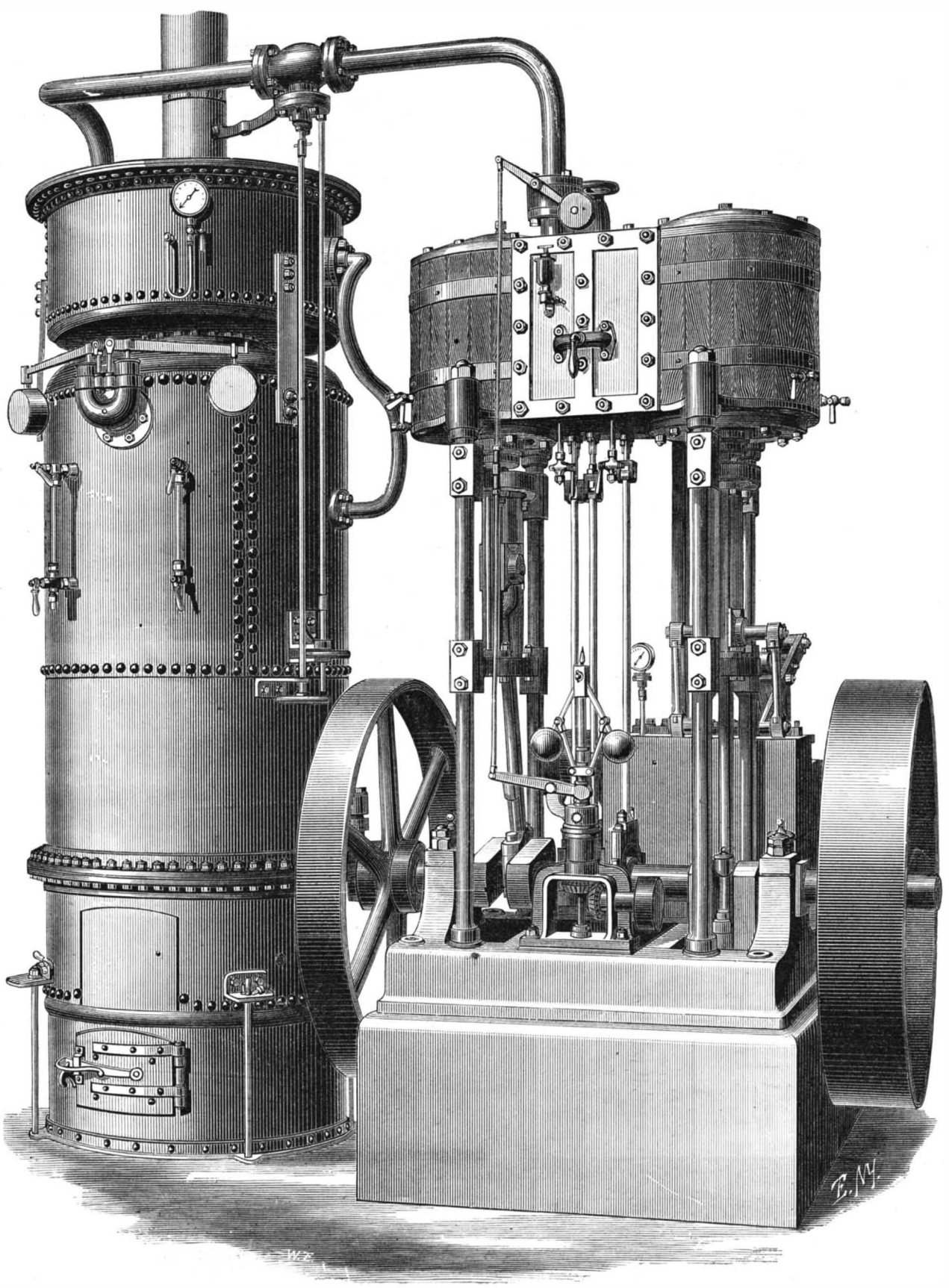
We give herewith a perspective view, from *Engineering*, of a vertical compound condensing engine, constructed by Messrs. John Fowler & Co., of Leeds, England, for Mr. John Allison, of Lancaster Gate, and a boiler constructed by Messrs. Fraser Brothers, of London, according to the patented designs of Mr. Allison. We also give, in Figs. 1, 2, and 3, page 194, sectional views of the boiler.

The engine is of the compound intermediate receiver type, the cranks being at right angles. The framing consists, as will be seen from the engraving, Fig. 1, of four wrought iron standards, 2¼ inches in diameter, connecting the cylinders and bed plate, these standards being each made square at two points in their height to facilitate the attachment of the stays which carry the guide bars. The cylinders are both steam jacketed, and they are 9 inches and 15 inches in diameter respectively, the stroke of both pistons being 1 foot 4 inches. The engines are intended to be run at a piston speed of 400 feet per minute. The small cylinder is fitted with an adjustable expansion valve at the back of the main slide, while the low pressure cylinder has a single valve only. The air pump is vertical, and is worked by levers connected to the crosshead of the low pressure piston.

The boiler is of a type designed and patented by Mr. Allison. As shown in the sectional views, the fire is contained in a chamber lined with firebrick and situated below the boiler, this chamber forming a prolongation of the internal firebox. The air on its way to the firegrate passes down between the exterior of this chamber and an annular brick pier on which the boiler is supported. Holes are formed in the sides of the furnace chamber for the admission of air above the fire if required. This arrangement of brick-lined furnace is one well adapted to secure good combustion, but we may remark that Mr. Allison does not propose to employ it in all cases, it being intended that the grate should, in the majority of instances, be fitted at the bottom of the firebox in the usual way.

As shown in the vertical section, a series of bent tubes extend from the sides of the firebox to the crown, these tubes being disposed in four rings, as shown. The firebox is surrounded by an annular diaphragm plate for the purpose of separating the upward and downward currents, and thus promoting circulation, while at the upper ends of the bent tubes deflectors are placed, as shown.

[*Continued on page 194.*]



VERTICAL COMPOUND ENGINE AND BOILER.

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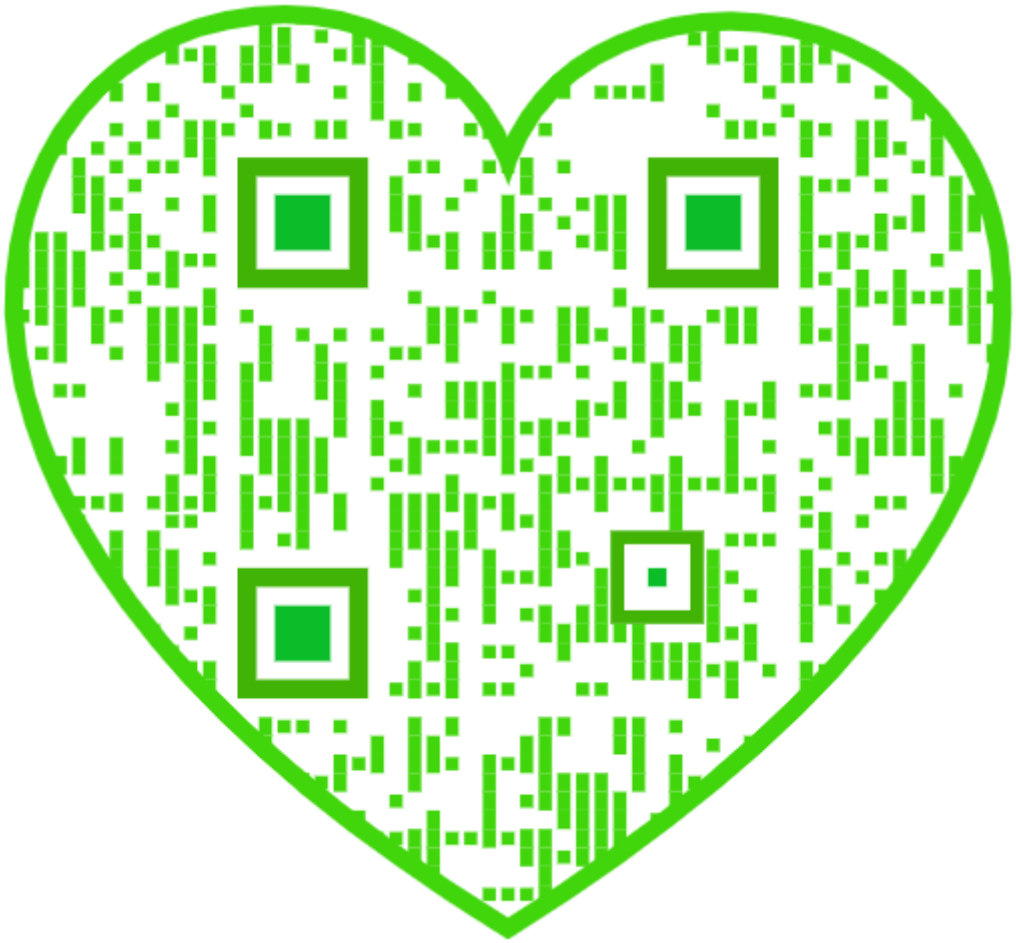

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DISGUST.

A remarkable and ingenious analysis of the sensation of disgust and the causes to which it is owing, has recently appeared in the *Revue des Deux Mondes*, over the signature of M. Charles Richet. We regret that our limited space precludes notice of the wealth of illustrative instances which the author brings forward to negative the old saying, and to reach a result which shows that, if "there is no accounting for taste," there is at least a very plausible accounting for *dis*taste. The reasoning, however, of which we have prepared the following summary, is well worth consideration:

There exists in nature, for man as well as for all other living beings, certain substances which are alimentary and others which are not. There exists also a special sense which warns us of the nutritive value of different substances. This sense depends upon the sense of taste. Milk, sugar, and meat are aliments, and taste testifies to the fact, inasmuch as it is agreeably excited by all three. Nor could the contrary be true. Nature could not have inspired us with repugnance for that which should and does constitute our nourishment. Moreover, and besides the sense of taste, by a very simple association of ideas, the senses of smell and sight are affected so that these aliments gratify us both by their odor and aspect.

Co-ordinate with taste exists a totally opposite sense, namely, disgust. This is a sort of pain which, if it is too prolonged or too intense, leads to nausea. But if taken in its restricted meaning, it is simply the perception of a disagreeable odor or flavor. Thus bitter and fetid substances produce disgust. If by an effort of the will we eat such bodies, then nausea supervenes. Similarily sight and feeling may also produce in us disagreeable sensations comparable to the foregoing, so that there may be recognized, first, gustative and olfactory disgust, and second, visual and tactile disgust, all of which produce similar effects.

It is certain that the exterior objects themselves are not inherently disgusting; but are so only in their relation to ourselves. For if our organs were otherwise constituted, we should experience other sensations. Fetidity, bitterness, or ugliness are not essential qualities of objects. Such attributes are a portion of our own perception. This is evident from the fact that certain objects disgust some animals, while the same are a source of pleasure to others. The odor of decomposition is insufferably disagreeable to human beings, yet it is delightful to flies, vultures, and carrion crows. Objects disgusting to one person are not necessarily so to another. Laplace ate spiders and enjoyed them. A king of France sickened at the odor of strawberries. Digger Indians eat grasshoppers. A recent Chinese traveler gives an instance of where the inhabitants, while devouring a meal of decayed fish, turned in violent disgust from roast duck. The toad is to many people repulsive. Yet it is not essentially hideous. "The female toad to the male toad," says Voltaire, "is an ideal of beauty." Nothing is ugly or fetid in nature; but things seem so only because they are in a certain relation with our organization.

Despite the mass of contradictory facts which envelope it, there appears to be an underlying law which connects this instinct of disgust to the instinct of self-preservation. How the first is to be acquired is to be explained only as a fact of heredity. The struggle for existence and natural selection have given to our ancestors an accumulation of instinctive sentiments, each appropriated to the protection of certain organs. Bitterness no more exists in strychnine than does pain in a knife or redhot iron. Yet strychnine seems to be bitter and the knife cut painful; and in these sensations nature provides us with a safeguard against the dangers of both. Similarily, reptiles dangerous to man inspire us with an extreme repulsion. Foul gases and purulent liquids, by affecting the three senses of taste, smell, and feeling, likewise by the disgust produced, warn us of their perils. But instinct is, nevertheless, blind. Quinine, for example, which it recognizes as bitter and distasteful, is often salutary and beneficial.

As a consequence of this hereditary acquisition of instinct, it follows that the substances not met with in nature cannot have any action on our senses if their constitution is totally different from those with which we or our ancestors are or have been familiar. Suppose, for example, that a plant should be discovered containing a dangerous but hitherto unknown alkaloid. As this might have some properties of, and hence the taste of, other alkaloids, such as quinine or strychnine, we should thus be warned; but if, on the contrary, it had all the chemical properties of sugar, then its savor would be sweet, and we could not tell whether it was or was not a healthy and useful aliment. The same is true of artificial bodies: the cyanides and prussic acid are found but in very minute quantities in nature, yet their taste is not disagreeable. Carbonic oxide, a most dangerous gas, is without odor, and is unrecognizable to the senses. It is not a natural product, inasmuch as it is due to incomplete combustion; hence, as it must be artificially made, the ancestors of our race never encountered it.

Besides this law of nocuity, there is another which may be termed that of inutility, as being at the foundation of disgust. Everything useless is revolting. The products of secretion, for example, are repulsive to sight and smell, when the organism rejects them as useless. Milk, on the other hand, is agreeable both in taste and odor.

Disgust, lastly, may be produced by mere recollection, without any actual sensual impression. When we speak of a toad, we think of a toad and the idea may be disgusting; but if, while speaking, we consider the toad from a special point of view, as, for example, its habits, its physiological nature, its use to the farmer, etc., then the sentiment of disgust vanishes. Similarly, in works of art, where the dominant idea may be one which naturally would cause disgust, yet the idea may be so combined with others that the feeling is not experienced, but, on the contrary, the general impression is agreeable.

To sum up, disgust is an instinctive sentiment of self-protection, variable with the species, and according to the alimentation, habits and education of individuals. It is the consequence of heredity, but it is an imperfect instinct, since it judges simply by form and appearance.

ANOMALIES IN THE TEMPERATURE OF THE BOILING POINT.

It has been observed that the mere contact with certain surfaces retards the boiling. For instance, in a metallic vessel water boils with perfect regularity, and at a temperature properly corresponding to the pressure to which it is exposed; the vapor bubbles which develop on all points of the walls of the vessel are very small and follow one another with perfect regularity. In vessels of glass and porcelain, to the contrary, the vapor bubbles develop only at few points, which are always the same. The bubbles are large, and do not follow one another with rapidity. The temperature of water boiling in glass vessels is also higher, often as much as 2° Fah., than the temperature of water boiling in metallic vessels under otherwise the same circumstances.

The boiling of sulphuric acid takes place in glass vessels only with intermittent impulses. The temperature rises above the regular boiling point, until at the bottom of the vessel a large vapor bubble is formed, the appearance of which is always accompanied by a lowering of the temperature. Such irregularities in the boiling are easily avoided by throwing platinum wire on the bottom of the vessel containing the liquid.

Water deprived of air, and enclosed in a glass tube from which the air has been exhausted, boils only at a very high temperature. A water hammer, which is arranged as described, may sometimes be heated to 275° or 300° Fah. without the water boiling; when, however, the boiling commences it is so sudden and explosive that the glass tube bursts in fragments.

Dufour found that a liquid may be heated far above its normal boiling point without actually boiling when it is surrounded with another liquid of higher boiling point, in which it will not dissolve. If water is gradually poured, drop by drop, on linseed oil heated to 220° to 230° Fah., the drops fall slowly through the oil without showing the formation of any vapor, while this only takes place when they come in contact with the bottom of the vessel, when they boil away violently, and steam passes rapidly upward through the oil. By mixing some fatty oil with a liquid may be obtained, which, when hot, has the same specific gravity as water, and in which globules of water, of various diameters varying from $\frac{1}{20}$ to $\frac{1}{3}$ of an inch, will remain suspended without rising or falling. By careful heating the temperature can be raised to 250° and even to 340° before the water commences to boil. When, however, a drop of water so heated comes in contact with the side of the vessel, or with a solid body, such as a wooden or glass rod, it boils at once away with great violence, almost explosive.

That this property is not confined to water but to other liquids has been proved by various trials. So, for instance, when chloroform, which, when heated by itself, boils at 142°, is poured in a solution of chloride of zinc, brought to the same specific gravity by proper dilution, the chloroform globules will remain suspended and the solution of chloride of zinc may be heated to 200° or 212°, before the chloroform will boil; but also here the contact of any solid body will cause it to flash into vapor.

All these phenomena are explained by the fact that liquids adhere very strongly to certain solids, and more to glass than to metal. But that liquids adhere still more to other liquids, even when they do not intermingle (such as water to oil or chloroform), is proved by the last mentioned interesting experiments of Dufour, in which the water globules suspended in a mixture of two oils of the same specific gravity, also demonstrate the mutual adhesion of the water particles, in the same way that in the experiment of Plateau the suspension of oil globules in a mixture of water and alcohol, of the same specific gravity, demonstrates the mutual adhesion of the oil particles. But the experiment of Dufour is the most remarkable, demonstrating as it does how the effect of heat in separating the liquid particles and changing them into vapor needs the contact of solid bodies to be effective, and may be counteracted to a certain degree by withdrawing the liquid from the contact of any solid body, by supporting it floating in another liquid.

SUN SPOTS AND FAMINE.

It has been surmised that some relation exists between sun spots and prevalent weather on the earth, and the theory has been proposed that periodic variations in climate bear some relation in recurrence to the cyclical periods when the sun spots are most or least numerous. Dr. Hunter, Official Director-General of Statistics, has recently directed the attention of the government of India to this alleged connection between the periods of maxima and minima sun spots and the amount of rainfall at corresponding times in the Madras Presidency, where a great famine is now impending. General Strachey, however, in a recent communication read before the Royal Society, after a careful examination of the

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recorded rainfalls in Madras, Calcutta, and Bombay for the past 64 years, comes to the conclusion that no real connection has been established between rainfall and sun spots, and shows that, even if such were apparently the case as regards Madras, the same would be true in Calcutta and Bombay, whereas the rain tables of those localities show no such coincidence.

THE AGRICULTURAL VALUE OF WORMS.

In 1837 Mr. Darwin, in a paper read before the British Geological Society, explained how the formation of vegetable mold which forms a covering several inches in depth on the surface of productive land was directly due to the common earth worm. The soil, he stated, was simply the non-nutritious matter contained in the earth originally eaten by the worm and rejected by it, and the accumulated deposits of large numbers of worms produced the extensive layers commonly found. Quite recently Herr Von Hensen has investigated further into this subject and has confirmed Darwin's conclusions while supplementing with many of his own. An abstract of his investigations appears in the XIXth Century.

He states that the adult worms come to surface at night and, with their tails in their burrows, collect the twigs, leaves, etc., which serve as their food. This material is heaped around the orifice of the burrow and is drawn in piece by piece, the leaves in time becoming macerated and decomposed, and thus rendered suitable for the worms eating. The investigations were conducted in a garden having a layer of mold 9 inches deep and a subsoil of yellow diluvial sand. The worm tubes were not easily traced in the mold, but were perfectly clear in the sand, running vertically downwards to a depth of from 3 to 6 feet. On the walls of these burrows the black masses of excrement of the worms were plainly visible. Some tubes were entirely filled with this substance, the black color of which was diffused into the adjacent soil. In about half the inhabited tubes, plant roots had entered, following their course. By extended observations the author states that the roots of annuals can only penetrate into the subsoil through channels opened out to them by earth worms, and he observes that this penetration must be of service to the plant, as the subsoil retains moisture longer than the surface layer of the mold.

In order to ascertain the precise part taken by the worm in making this vegetable mold, two worms were placed in a glass vessel filled with sand, on the surface of which was spread a layer of fallen leaves. The worms set to work at once, and after about six weeks the surface of the sand was found to be covered with a layer of mold nearly half an inch deep, while many leaves had been carried to a depth of three inches. Worm tubes ran in all directions through the sand; some were quite fresh, others had a wall of mold an eighth of an inch thick, others again were completely filled with mold. In short the soil of the vessel was already perfectly well prepared for the growth of plants.

Herr von Hensen finds that, although the earth worm weighs only about 46 grains, it produces in four hours nearly 8 grains of excrementitious matter. On an average he finds about 34,000 worms to an acre of ground. Their combined weight is therefore over 220 pounds and they produce about 37 pounds of mold in 24 hours. Besides this, they produce a uniform distribution of the mold, open up passages in the subsoil for roots, and render the subsoil fertile.

THE INTERNATIONAL RIFLE CONTEST.

The most accurate marksmanship ever exhibited in a public competition was displayed by the American and British teams in their recent contest at Creedmoor. The figures made not only by the American team which won, but by the losing British team, have never before been equaled. On the first day the American score stood 1655, out of a possible 1800, and the British 1629; on the second day the totals were respectively 1679 and 1613, giving, for full scores, Americans 3334 and British 3242. The Americans beat their own winning score of last year, over the Scotch, Irish, Canadian, and Australian teams, by 208 points.

The ranges were as usual 800, 900, 1,000 yards, each rifleman having 15 shots over each range. As a bullseye counts as 5, the highest possible figure which can be made by each man is 450. The largest individual scores were made by Messrs. L. C. Bruce and C. E. Blydenburgh of the American team. Mr. Blydenburgh counted 429 out of the possible 450 on his six targets, and Mr. Bruce 425. The leading British total, made by Sir Henry Halford, ranks seventh as compared with the American list.

It is generally conceded that the American team owe their success not merely to superior skill but to better weapons and more perfect organization than were possessed by the English.

METEORIC HEAT.

In our abstract of the proceedings of the British Association at Plymouth, in last week's issue, we noted Sir William Thompson's rather untenable idea of the possibility of the importation of life from other planets to our earth by means of a meteorite. The supposition was that as some germs are known to be able to withstand a comparatively high degree of temperature, and as in fact the exact degree fatal to all forms of life is not definitely known, therefore it was possible that some germs might stow themselves away in a deep crevice of the meteorite, and so be transported to earth none the worse for the heat to which they might be subjected during the voyage.

The velocity of meteorites has been found to be between 51,200 and 512,000 feet, or say, on an average, 30 miles per second. Assuming this last mean, M. Govi, in a recent communication to the French Academy of Sciences, has shown that a meteorite striking our atmosphere at a distance of about 95 miles from the earth, where the pressure about equals ·04 inch of mercury, would lose, through the resistance of this highly rarefied air, half its velocity, which would be reduced to about 89,600 feet, or say 15 miles per second. If the meteorite continued into the atmosphere until it reached a point where the pressure was ·4 inch of mercury, its velocity would then be reduced to 18,931 feet, or between 3 and 4 miles, and finally, if it succeeded in attaining a region where a pressure corresponding to 4 inches of mercury prevailed, its velocity would be only 1,619 feet per second.

The consequence of this loss of motion is development of heat proportional to the mass multiplied by the square of the velocity. Now M. Govi has calculated that, even at that extreme height where the barometric pressure is equivalent to but ·04 inch of mercury, the heat developed by the loss of motion of the average meteorite amounts to three million calories, equivalent to that required to raise 6,600,000 lbs. of water 1·8° Fah. As the heat developed increases as the meteorite enters further into our atmosphere, it is somewhat improbable that any such body ever reaches our earth until it has been subjected to a temperature much more than sufficient to destroy any form of organism.

INFLUENCE OF LIGHT ON THE ELECTRIC CONDITION OF METALS IN SALINE SOLUTIONS.

Metal plates were placed by Herr Hankel, one in a porous battery cup (closed by a cork) the other in a transparent exterior vessel. The vases were filled with solution and en closed in a blackened box in which was an aperture which could be closed at will, or before which colored screens could be placed.

With two plates of polished copper, plunged in water, the plate on which the sunlight fell was negative. The action of colored rays reached its maximum in the blue. When the copper became more or less strongly oxidized or covered with salts, the plate, at first positive, then became negative and kept its sign when the light was altogether suppressed. The action is ascribed principally to the feebly refrangible rays, while the dark blue or violet rays render the plate negative. Polished copper in sulphate of copper became first negative and then strongly positive.

Other metals gave the following result: Clean plate of polished silver, in water, negative; lightly silvered platinum, positive; silver covered with platinum, strongly positive; tin, negative; brass acted like oxidized copper; amalgamated zinc, in solution of $ZnO.So_3$, strongly negative; ordinary zinc, nearly neutral (hence the action of the battery is due to the oxidized copper); and platinum, weakly positive.

The author has also studied the action of heat on the zinc-copper-water element, of which he states the electric motive force becomes augmented, while it is enfeebled by light.

The New Metals Neptunium and Davyum.

Herr H. Herrman, who for many years has been investigating the metals of the tantalum group, announced not long ago his probable discovery of a new metal, which he believes to be a fourth member of the above named group, and to which he gives the name of neptunium. The mineral, in which evidence of the existence of the metal is said to have been found, came from Haddam, Conn., and was reputed to be tantalite, though on examination it proved to be a mixture of columbite and ferro-ilmenite. Only 40 grains of the hydrated acid of the new metal were obtained, not sufficient for its isolation. The atomic weights of the metals of the tantalum group, including this new discovery, are as follows: Tantalum 176, neptunium 118, niobium 114·2, and ilmenium 104 6. Their densities are: Tantalum 10·7, neptunium 6·5, niobium 6·5, and ilmenium 5·9. Ilmenium was supposed to be obtained by the same chemist from a Swedish mineral, which he called yttro-ilmenite several years ago; but its existence, in view of the subsequent researches by M. Marignac, is now considered doubtful, and hence it is generally omitted from the list of elements.

The second new metal, davyum, was discovered by M. Sergius Kern, of St. Petersburgh, Russia, who ascribes it to the platinum group. It was discovered in separating the metals rhodium and iridium from some platinum ores. It has been isolated in the form of a hard silvery metal, slightly ductile, extremely infusible, and having a density of 9·385 at 77° Fah. It is named after Sir Humphrey Davy, and the discoverer thinks it may occupy a place between molybdenum and ruthenium in the system of elements, arranged according to Mendeleeff's law of periodicity.

Influence of Wine Bottles on Wine.

It has recently been determined in France that wine may be injured through the glass of the bottles in which it is contained being too alkaline. According to analyses given the *Revue Industrielle*, glass for wine bottles should yield per 100 parts: silex, 58·4; potash or soda, 11·7; lime, 18·6; clay and oxide of iron, 11; other ingredients, 0·3. Glass in bad bottles has been found to contain, silex, 52·4; potash or soda, 4·4; lime, 32·1; clay and iron, 11·1. It seems that the wine suffers principally from excess of lime. Thus, in glass composed of silex, 45, soda, 15, lime, 30, and clay, 15, for example, the wine became thick and lost its aroma. The best bottle glass contains from 18 to 20 parts lime and 59 to 60 silex; the worst, 50 to 52 silex and 25 to 30 lime.

Stationary Meteors.

To the Editor of the Scientific American:

A few minutes after ten o'clock on Friday evening, September 7, 1877, Mr. John Graham, of Bloomington, Ind., had his attention arrested by a sudden light in the heavens, and on looking up he saw a stationary meteor between *Aquila* and *Anser et Vulpecula*, about R.A. 295°, declination 15° N. It increased in brightness for a second or more, and disappeared within less than half a degree east of the point in which it was first seen. Immediately after the extinction of the first, three others, separated by intervals of three or four seconds, appeared and vanished in the same place, with the exception that one disappeared about as much west of the radiant as the first did to the east of it. Mr. Graham's curiosity was excited, and he continued to watch till, after an interval of a few minutes, a fifth meteor, corresponding in appearance to the preceding, was seen in the same place. The meteors were about equal to stars of the first magnitude. The facts indicate that a stream of meteoric matter was moving at the time almost exactly towards the observer. Two or three isolated instances of stationary meteors have been recorded; the phenomena of the 7th inst. are, however, quite extraordinary.

I have stated the observations as given me by Mr. Graham, who pointed out the position in which the meteors were seen.

DANIEL KIRKWOOD.

Bloomington, Ind.

One Reason why the Moons of Mars were not Sooner Discovered.

Mr. George R. Cather, in recounting the reasons given by Professor Newcomb before the American Association for the Advancement of Science, at Nashville, why the satellites of Mars were not sooner discovered, makes the suggestion that these satellites are of recent origin, and says: "This may be groundless, yet it is but fair, if there could be such a probability, let its weight be ever so little or great in the solution of the question, it should be stated for what it is worth. But as a reason, it is of greater importance than at first glance may be imagined; for if it is admitted as a remotely probable reason, it suggests the profoundest problem of the age—that is, that the satellite systems of the planets have been supplied by the asteroidal belt of our planetary scheme—a theory I propounded several years ago, and which since has become a solid conviction of my mind, as careful investigation of our planetary structure has confirmed me in this opinion."

A Tree that Rains.

The Consul of the United States of Columbia in the Department of Lereto, Peru, has recently called the attention of President Prado to a remarkable tree which exists in the forests adjoining the village of Moyobamba. This tree, known to the natives as Tamai-Caspi (rain tree), is about 58 feet in height at full growth, and the diameter of its trunk is about 39 inches. It absorbs and condenses the moisture in the atmosphere with astonishing energy, and it is said that water constantly exudes from its trunk and falls like rain from its branches. So abundant is the water supply that the soil near by is turned into a marsh. The tree gives forth most water when the rivers are dry during the summer season, and when water generally is scarce. Its cultivation is proposed throughout the arid regions of Peru.

Bodily Recoil.

The curious fact has recently been pointed out by Mr. J. W. Gordon, in the *Journal of Anatomy and Physiology*, that at every beat of the heart, the whole body is projected a small but perfectly observable distance in a direction from foot to head—that is, so that any pressure exercised by the feet would undergo a diminution, while a pressure exercised by the head would be increased. When the heart contracts a quantity of blood is propelled down the aorta, while at the same time, the whole body is caused to recoil with a velocity which bears the same ratio to the velocity of the blood as the weight of blood driven out bears to the weight of the body.

When the Birds Wake Up.

A French ornithologist has lately been investigating the question of at what hour in summer the commonest small birds wake up and sing. He states that the greenfinch is the earliest riser, as it pipes as early as half-past one in the morning. At about half-past two the blackcap begins, and the quail apparently wakes up half an hour later. It is nearly four o'clock, and the sun is well above the horizon, before the first real songster appears in the person of the blackbird. He is heard half an hour before the thrush; and the chirp of the robin begins at about the same length of time before that of the wren. Finally, the house sparrow and the tomtit occupy the last place on the list. This investigation has altogether ruined the lark's reputation for early rising. That much celebrated bird is quite a sluggard, as it does not rise until long after the chaffinches, linnets, and a number of hedge-row birds have been up and about.

The American Association for the Advancement of Science.

The Nashville session of the above named body adjourned on September 4, to meet again on the third Wednesday in August, 1878, at St. Louis, Mo. Professor E. C. Marsh, of New Haven, was elected to preside at the next session. Full abstracts of the principal papers lately read will be found in current issues of the SCIENTIFIC AMERICAN SUPPLEMENT.

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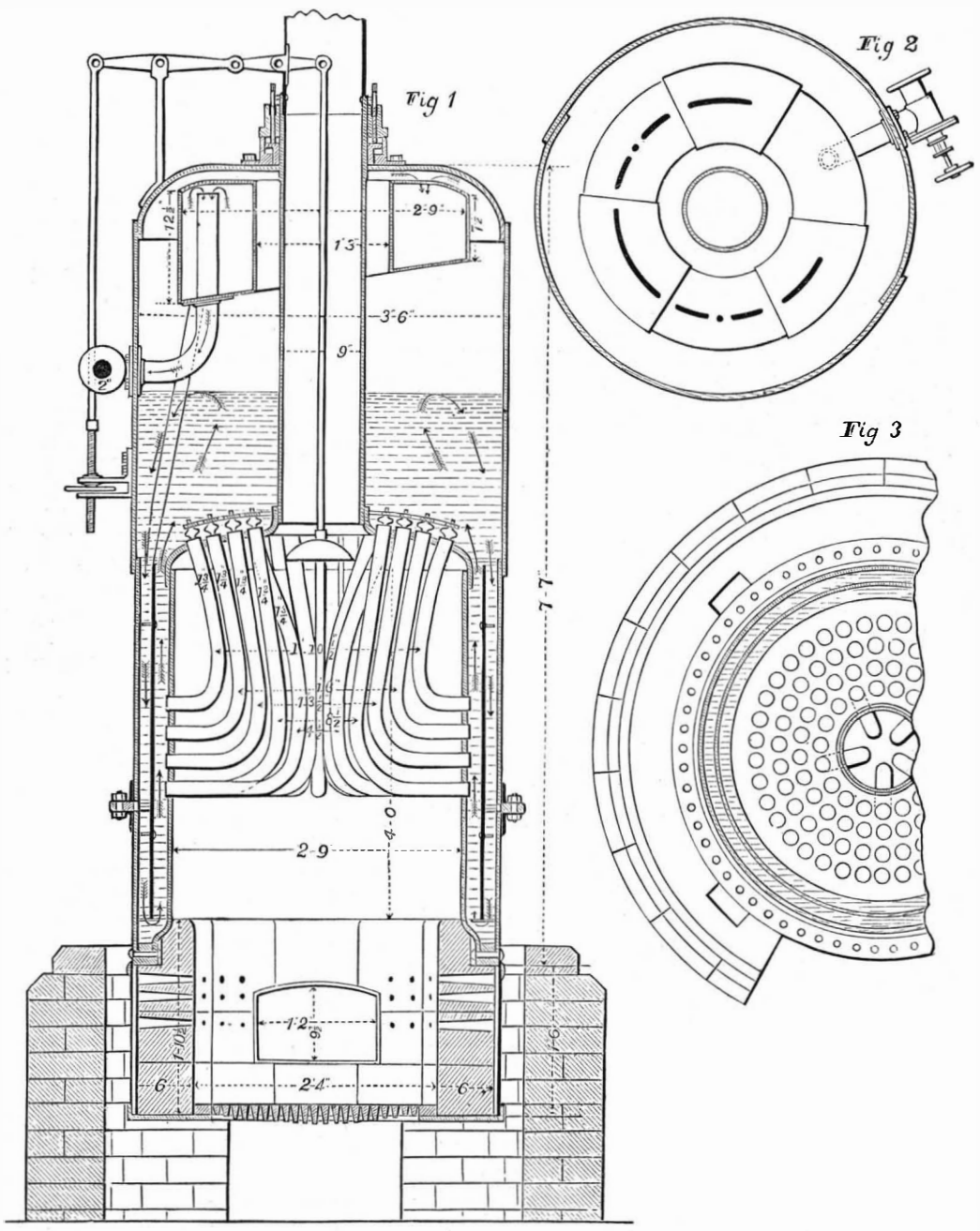
[*Continued from first page.*]

To facilitate cleaning and repairs, the boiler shell is made in two parts united by a bolted joint, as shown, the upper part of the shell sliding on the uptake or chimney. This uptake passes through a stuffing-box at the top of the boiler, the part of the uptake which traverses the stuffing box being thickened and screwed to receive a deep brass nut which bears upon the top of the stuffing-box, as shown, and through which pass screws for setting up the gland. This arrangement enables the uptake to act as a stay between the crown of the fire-box and the shell, while at the same time, by slacking back the brass nut just mentioned, the upper part of the shell is left free to be raised when the bolted joint which unites it to the lower portion is broken.

To secure dry steam, the steam pipe is made to communicate with an annular chamber in the steam space, as shown in Figs. 1 and 2, this chamber having slots formed on its top for the admission of steam, while its bottom is made to slope towards one side of the boiler, a drain pipe—led down below the water line—being provided to take away any water which may be carried into the chamber by the steam. In addition to this chamber, the boiler, of which we are now speaking, is provided with an external separator, as shown in the perspective view.

The principal dimensions of the boiler are given in the engravings. The area of the firegrate is 4 square feet, and of the heating surface 162 square feet, this latter being made up of 38 square feet of fire-box surface and 124 square feet of tube surface.



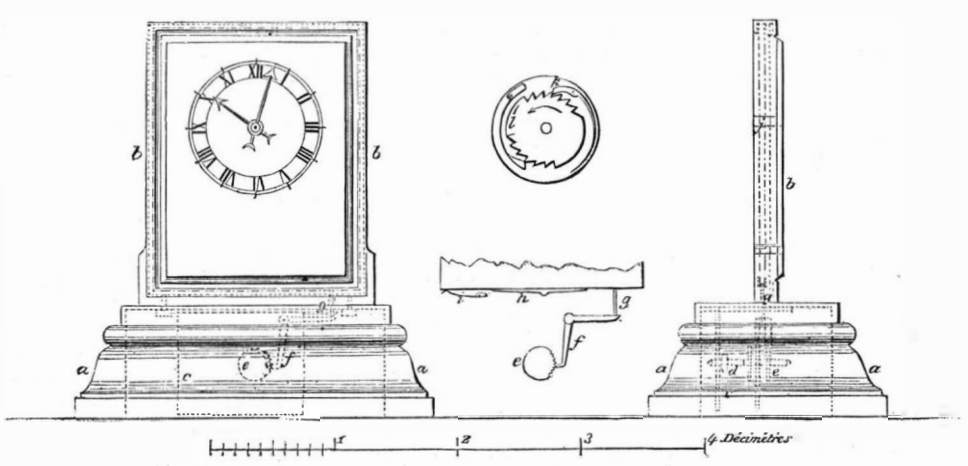
ALLISON'S VERTICAL BOILER.

TELLURIUM.

BY THEODORE BERDELL.

Tellurium is one of the rare minerals, and up to the present time has been found but in small quantities. As there is no use in the arts for this metal, it is worthless, and is mined only for the gold and silver it contains. As a very complete description of all the varieties exists in Dana's "Mineralogy," the names need only be given here as follows: Native tellurium, tetradymite (Bi_2Te_3); Joseite, same, with the Te replaced by S and Se; Wehrlite, same, with Bi replaced by a little Ag; Altaite, Pb Te; Nagyagite, same, Pb replaced by Au Ag, Hessite, Ag Le; Petzite, same, Ag replaced in part by Au; Sylvanite (Ag Au), Te_3; Montanite, TeO_3BiO_5; Melonite, Ni Te; Calavarite, Au Te; Coloradorite (new), Hg Te, discovered by Professor F. A. Genth from the Mount Lion Mine; Magnolico Lionite; and, lastly, one variety the writer claims to have discovered from Mt. Lion Mine. Analysis: Te 53, SiO 35, FeO 4, Au 1·75, Ag 10. Deducting the SiO, this would be almost native tellurium. It has, however, an entirely different crystalization and resembles an artificial product very much like a matte. I have only found a very little of it. One of the simplest tests for tellurium is boiling in SO_3, giving the purple color. SO_3 does not dissolve a very large quantity, and soon becomes saturated when the tellurium is thrown down, the same as if water had been added. Another very good test is by the use of the blowpipe as follows: Put a small sample well pulverized on a porcelain dish; direct the flame; TeO_2 is formed, and gives a coating, of course white. While still warm, add a drop of SO_3, and the purple color appears. This is very distinct from any of the other metals. Tellurium dissolves in NO_5 to TeO_2, which is again dissolved by HCl, and can be precipitated by H_2O. The TeO_2 can be reduced to the metallic state by mixing with powdered charcoal and smelting quickly in a muffle. This process gives a very pure article. Another way consists in melting raw ore with a very quick and readily fusible flux in a crucible, leaving it in the muffle, which should be at a red heat, only long enough to form the slag, say five minutes. The metallic button thus obtained, which is only Te, Au, and Ag, is again fused at a low heat in a stream of chlorine gas. The tellurium goes off as TeCl, and is collected in water precipitated as TeO_2, and smelted as before. By this method some of the tellurium is lost in the first melting. Probably about three or four per cent. By roasting, gold is brought to the surface. The tellurium at the surface is evolutilized, leaving the gold thereon. This is one of the ways our miners find the richness of their ore themselves, for the gold is their only aim. It can be done in any ordinary stove by placing the specimen on the hot coals. A better plan is to use a muffle admitting a good supply of air. The muffle is kept at a low red heat which, towards the last, is raised. The tellurium burns with a light-bluish flame, and gives off the white dense fume of TeO_2; the other is the tellurium in the natural state. The mines producing the richest ore in tellurium are the Smuggler, John Jay, Mt. Lion, and Keystone, Colorado. I have had specimens (deducting the quartz) that yielded from 92 to 97 per cent tellurium. The largest amount I have ever seen was about 400 lbs., shipped from the John Jay Mine; this would run about 50 per cent tellurium. The ores containing the most silver and gold are at Gold Hill and Sunshine, being the Red Cloud, American, and Malvina mines. I have made assays as high as $125,000 in gold and silver, and have sayed samples of lots of ore sold to the smelter running as high as $18,000 to the ton. Such lots are, however, the exception. The average value of the ore taken and sold to the smelter, from these mines, is from $300 to $800 per ton. It has been a question of how deep these tellurides extended; as these mines have only been worked for a short time, the developments have not been very great. An enterprise known as the Corning Tunnel started a tunnel under Gold Hill; and after running about 800 feet, struck a vein about 500 feet below the surface, which contained as fine telluride as any found. This has given great encouragement. At present capital is needed for opening the mines.

Denver, Col.



ANOTHER MYSTERIOUS CLOCK.

Vitriol Vinegar.

The Board of Health of the District of Columbia has condemned five car loads of vinegar sent there from Chicago, on the ground that it is not a genuine article, and is injurious to health.

An analysis of the so-called vinegar has been made. It appears, according to the report of the Board of Health, that the vinegar contains $54\frac{54}{100}$ grains per gallon of anhydrous sulphuric acid, combined with lime, to form a sulphate of lime equivalent to $117\frac{36}{100}$ grains of gypsum per gallon, and besides that, five grains of free sulphuric acid per gallon. The Board also reports that this sample was taken from an invoice of more than 1,000 barrels brought there to be sold as vinegar, and that it is likely to find a ready sale on account of its low price. The report concludes as follows: "When we think that oil of vitriol (sulphuric acid) can be bought at five cents per pound, and that a pound of said acid would render a barrel of fluid as acid as the strongest vinegar, the wonder will cease that it is sold cheap. This, therefore, is a fraud upon commerce, and a dangerous substitute for vinegar." The fraud and danger are more general than the great mass of people will readily believe. It is asserted that probably one half the vinegar sold at city groceries is a rank poison with either sulphuric or other objectionable acids for its base.

ANOTHER MYSTERIOUS CLOCK.

M. Cadot, an ingenious clockmaker of Paris, who has already devised several forms of clocks which apparently work without works, has recently invented still another timepiece, calculated to puzzle even those who are familiar with Robert Houdin's arrangement of the double glass plate. Houdin's invention, which we explained not long ago, consisted in two glass disks placed parallel and contained in the same circular frame. On one was marked the dial, while the other turned on its center and was attached to the minute hand. The turning of the disk was imperceptible, and was effected by mechanism concealed in the surrounding frame. M. Cadot's new clock, an engraving of which, from the *Bulletin* of the French Society for the Encouragement of the National Industry, is given herewith, cannot, it is evident, be constructed on any such principle, because the glass plates are square, and, besides, they appear to be firmly set in the base support. The trick, however, will be readily understood from the diagrams. There are two plates, one of which, *a*, is fixed to the base, and on this the dial is marked. Both plates are enclosed in a single frame, *b*, but this frame is loose enough to let the rear plate oscillate a little. The lower middle figure represents the bottom of the plate which rests on a balance beam, *h*. In the space, *c*, of the standard, the clockwork is concealed, and this rotates a ratchet wheel, *e*, which has 30 teeth, once in an hour. The teeth of the wheel, *e*, engage in turn the hook, *f*, move the bell crank attached thereto, and thus give an up and down reciprocating motion to the rod, *g*, which pushes against the bottom of the movable glass plate. By means of this arrangement and the spring, *i*, the plate is thus caused to oscillate isochronously. In an aperture made through the center of both plates is the ratchet gearing, represented in the upper middle figure, and this communicates the motion of the plate to the minute hand. Finally, the latter in turn, by very simple concealed mechanism, operates the hour hand.

Cement for Fastening Knives and Forks into their Handles.

Take one pound rosin and half pound of powdered sulphur; melt together, and mix in about twelve ounces of fine sand or powdered brick. Fill the cavity of the handle with this mixture, melted. Make the shank of the knife or fork quite warm and insert in place and let it remain until cold, when it will be found to be firmly fixed. The handles of knives and forks should not be put in hot water.

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THE INDUSTRIAL APPLICATIONS OF THE ELECTRIC LIGHT.

We have from time to time noted the extension of the application of electric illumination to workshops, factories, railroad depots, and other establishments in France. In the following article based on a work recently published on the subject, in the above country, by M. Hippolyte Fontaine, the practical details of many instances where this mode of lighting is in successful employment are reviewed.

The electric lamp furnishes the only means of illumination whereby industrial work of almost every description may be continued as well by night as by day. The light produced is so abundant that, reflected by all objects, it becomes diffused like daylight, so that there are no absolutely black shadows, and in a properly illuminated shop it is possible everywhere to handle tools or to read. It is generally necessary, however, to use two lights, so that one may illuminate the shadows cast by the other. One lamp usually lasts for from three and a half to four hours, at the end of which time new carbons must be inserted. This, however, is the work of but a few seconds, so that the temporary extinction of the light is not materially inconvenient, especially if more than one lamp is used. Even this may be avoided in cases where continuity of light is a necessity, by arranging duplicate lamps, so that one is automatically ignited the instant another is extinguished. The light is not fatiguing to the eyes. In workshops where opal globes were first introduced, such screens were afterward found superfluous; and they were removed at the desire of the workmen. Under the electric light, colors appear the same as by sunlight, so that for dyers, weavers, and painters, a single lamp often proves a great convenience.

As a general rule one lamp will illuminate sufficiently an area of 5,120 square feet in a machine shop, half that area in a printing or weaving establishment, and four times that area on a quay, shipyard or other locality where fine work is not carried on. With these data it is easy to determine the cost of installation, knowing that of the complete apparatus. In France the expense of the latter, including lamp, magneto-electric machine, wires, etc., is about $480. The following instances exhibit the results of practical use:

WORKSHOP OF THE GRAMME COMPANY.

In this establishment the light was first introduced in 1873. A single lamp is used, taking the place of twenty-five gas burners. It has operated regularly for four years, and the average expense, incidentals included, has not exceeded 12 cents per hour. The room lighted is 16 feet high, and 1,468 square feet in area.

DU COMMUN WORKS AT MULHOUSE.

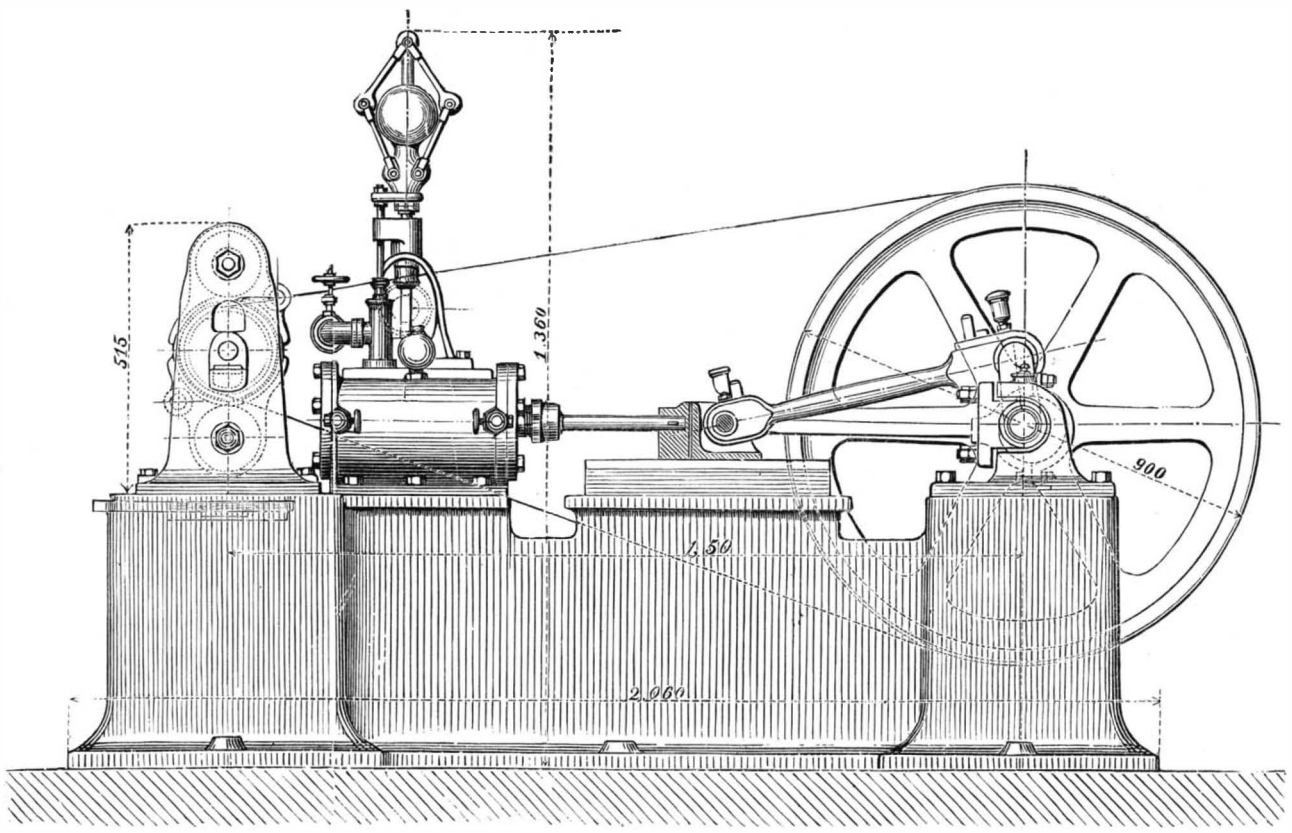
Four lamps each, worked by a Gramme machine, are employed in the foundery, a large hall of nearly 16,000 square feet area. The lights are attached to crossbeams sixteen feet above the floor. Cost of installation $2,000, or about the same as the expense would amount to for two hundred and fifty gas burners. The light obtained exceeds that of four hundred burners. MM. Heilman and Steinlen, of this establishment, have devised a special arrangement of magneto-electric machine and steam engine, which is represented in Fig. 1, and which is adapted for use in shops or aboard ship. The bed is made heavy in order to avoid all vibration, and the apparatus is quite compact, occupying a floor space of but twenty-three square feet. The fly wheel, to which the Gramme machine (which rests on the same support as the engine) is belted, makes 150 revolutions per minute, the Gramme machine 850 revolutions. The entire apparatus is sold in France for $800.

SAULTER, LEMONNIER & CO.'S SHOPS, PARIS.

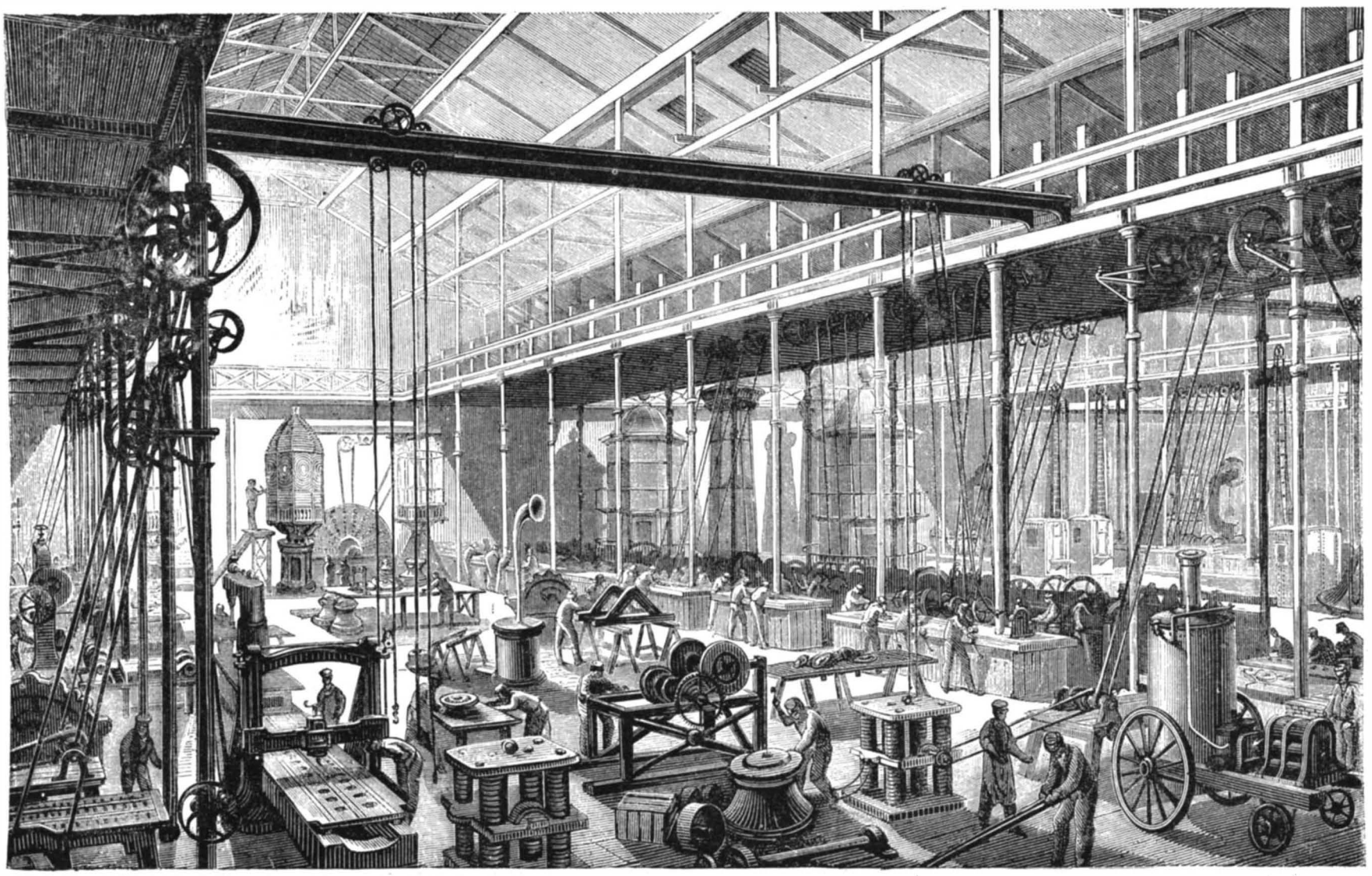
This is a well known manufactory of lighthouse lanterns. The workroom consists of two bays or sections, each 96 feet long by 80 feet wide; the intermediate space is 32 feet in width. On the lower floor are machine tools, and on the story above the patternmakers and moulders work. Three Gramme machines each maintain a light equal to one hundred gas burners, and the three lamps illuminate all the shops sufficiently to admit of the use of machines of precision, requiring delicate adjustments. The electric machines are located in the engine room, and are driven at the rate of from 850 to 900 turns per minute. About two horse power is required to operate each machine. Carbons are consumed at the rate of 2·7 inches per hour and cost about 40 cents per yard. So that each machine, equivalent to 100 Carcel burners, costs for maintenance 2·8 cents per hour *plus* the expense of motive power. In Fig. 3 the interior of the above named shops is represented, from which an excellent idea of their arrangement as well as the brilliancy of the illumination may be obtained.

MENIER FACTORIES AT GRENELLE, NOISIEL, AND ROYE.

These establishments include one factory for preparing india rubber, a sugar works, and the factory where the famous Menier chocolate is made. In each of the first two, three machines, each equivalent to one hundred and fifty



ELECTRIC LIGHT.—GRAMME MACHINE DRIVEN BY A STEAM ENGINE.—Fig. 1.



INDUSTRIAL APPLICATION OF ELECTRIC LIGHT.—Fig. 3.

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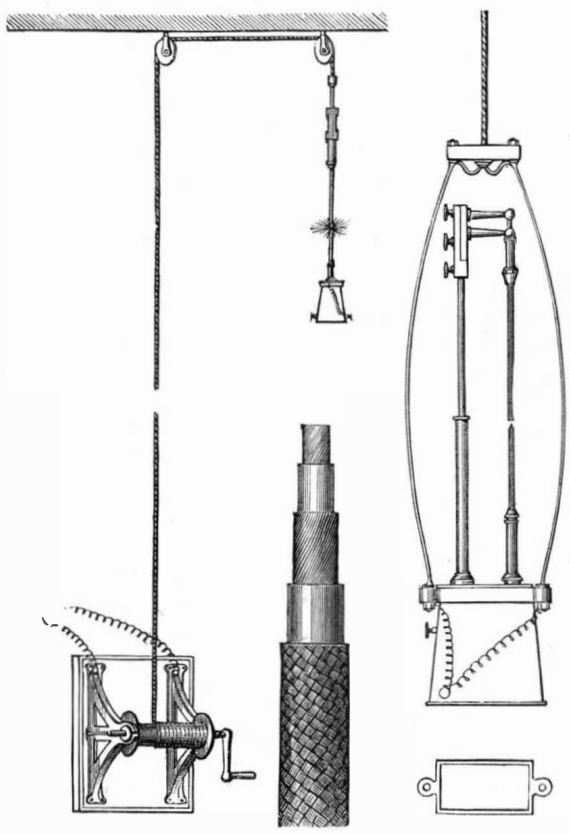
burners, and the last, eight machines are used. In connection with the lamps employed is a novel invention of M. Menier (Fig. 2), whereby the lamps can be reached for replenishing carbons, etc., without the use of a ladder or stairs. It consists of two cast iron brackets, mounted, supporting a hard rubber drum, and to each of which one of the conducting wires is attached. The brackets communicate metallically with the ends of the cable which is formed, as shown in detail in the illustration, of an exterior envelope of hemp, a layer of rubber, a wick-shaped layer of copper wire, another envelope of rubber, and finally a core of copper wire again. This is wound upon the drum and is hindered from unrolling by a small ratchet. The cable, after passing upward through two pulleys in the ceiling, is secured to a plate which is attached by curved rods to the lamp. The current is led to the latter by the cable, the core serving as one conductor, the intermediate copper envelope as the other. To reach the lamp it is obviously only necessary to lower it.

The Noisiel chocolate factory has eight machines arranged in two batteries of four each. They are operated by a hydraulic wheel. The wires lead to a commutator on the ground floor, which allows of the current of each machine being transmitted in fifteen different directions. In this way any machine may be used to supply the lamp in any particular room, so that, in the case of failure of any one apparatus, others are always ready. As this establishment is said to possess the most complete system of electric illumination ever employed, it is interesting to note the disposition of the lights. One lamp placed in a square lantern and suspended at a height of 22 feet illuminated a courtyard of 20,400 square feet area. Two other lamps each illuminate an interior court of 5,700 square feet. The torrefaction room, 141 feet long by 35 feet wide, and 24·6 high, is lighted by a single lamp placed on the floor. The light is projected by a parabolic mirror up to the ceiling, whence it is reflected and uniformly diffused. The moulding and weighing room is occupied by 90 workmen. It is 166 feet long by same width and height as above. Two lamps are used 80 feet apart and hung 19 feet high. The repair shops, of 4,080 square feet area, are illuminated by one lamp.



APPLICATION OF ELECTRIC LIGHT.—Fig. 2.

SPINNING ESTABLISHMENTS.

The employment of the electric light in several spinning establishments is noted. In that of MM. Ricard fils, the room on the first story is 10·5 feet long by 66·6 wide. Two lamps here illuminate 10 self-acting mules. The Gramme machines are placed at the extremity of the shops, and are operated by the motor of the works. The lamps are located 63 feet apart and are suspended at a height of 10·8 feet. This arrangement proved successful under the bad conditions of very low ceilings. The apartment in the second story is much smaller, and one lamp suffices for five mules.

FREIGHT DEPOT OF LA CHAPELLE, PARIS.

The space to be illuminated consists of a hall 192 feet long, 80 feet broad, and 25·6 feet high; a court 64 feet wide; and a car house 224 feet long, 48 feet wide, and 25·6 feet high. The hall is lighted by two lamps placed at a height of 5 feet, and arranged in lanterns, the glass of the lower part of which is painted white, so that the eye is not dazzled by the electric arc. The lamp is ample to allow of the business of expressage in all its details being carried on. The engineer of the depot reports that 25 per cent less men are now needed for night work. One lamp suffices for both car house and court.

HARBOR WORKS AT HAVRE.

In constructing the extensive operations required to enlarge the outer harbor of Havre, involving the removal of a large amount of rockwork and masonry, it has been necessary to labor principally during the hours when the tide is low. In order to carry on work at such times at night, the contractor has used two electric lamps, by which means 150 workmen, distributed over an area of 36,000 square feet, have continued the operations of blasting, etc., with the same facility as by day.

A large number of other instances are given, showing other applications of the electric light, but the above will suffice to exhibit its utility in a sufficiently varied range of industrial pursuits. It seems probable that the invention of the Jablochkoff candle, admitting as it does of the divisibility of the light, will result eventually in the employment of electric illumination everywhere in lieu of gas. In this view such details as are above given are of timely interest.

Communications.

Concerning a Small Steam Launch.

To the Editor of the Scientific American :

On page 140, (2), current volume of the SCIENTIFIC AMERICAN, T. and D. say they are greatly disappointed in the speed of their steam yacht. After comparing the performance of their yacht with that of the Flirt, described in SCIENTIFIC AMERICAN SUPPLEMENT No. 81, I think their disappointment is unjust, and for this reason, the Flirt is described by "Paddlefast" as "a very fast steam launch." She makes 10 miles an hour with 700 revolutions a minute, and pitch of propeller 25″; the steam pressure, cut-off, etc., not being an essential factor as far as the speed *per se* is concerned. Supposing nothing to be lost by slip, the Flirt ought, with the above figures, to make 16 miles an hour; as a matter of fact, however, she only makes 10, so there is about 0·375 of the 16 miles lost by slip. T. and D. say they made 5 miles an hour with 210 revolutions a minute and 3½ feet pitch of propeller. If nothing be lost by slip, they would make a little over 8 miles an hour, but they only make 5, so there is in this case as in the other ⅜ or 0·375 of the theoretical distance lost in slip. T. and D. say they want to make 10 or 12 miles an hour with her. If they do, they will have to either increase the number of revolutions, or put in a propeller with more pitch, or both. I would like to hear from T. and D. concerning the cut-off, size of ports, etc., of their engine, as it strikes us the fault lies more in the engine than the propeller.

I. N. PHILLIPS.

Knoxville, Tenn.

REPLY BY "PADDLEFAST."—With the above correspondent we believe a 5 x 5 engine ought to do more work. The boiler is far too heavy for the boat, causing too great a displacement for good speed. A smaller boiler, a higher steam pressure, and a two-bladed screw 28 inches diameter with 35 inches pitch, ought to give good results.

A Much-Needed Postal Convenience.

To the Editor of the Scientific American :

The large circulation of the silver currency, which has almost entirely superseded the paper fractional currency, brings with it some inconveniences. Large numbers of letters are mailed daily, which contain small sums of money—frequently less than one dollar. Even now, it is difficult to obtain the necessary "change" in paper fractional currency, and many persons substitute postage stamps, to the great annoyance of the individual receiving the remittance.

This state of affairs greatly increases a previously existing necessity for some method of transmitting small sums through the mails in some such manner as the larger postal orders are now transmitted. Perhaps the most advantageous plan would be to have stamps of the usual fractional denominations, kept for sale by postmasters at a sufficient advance on their face value to cover expenses, which would entitle the holder to their face value, and which might be cancelled or destroyed by the postmaster to whom presented. These stamps should be so designed as to be attached to postal cards if desired, and should also extend down to three cents, so that if a correspondent wishes he could "enclose a stamp" even when sending a postal card.

W. J. McGEE.

Farley, Iowa.

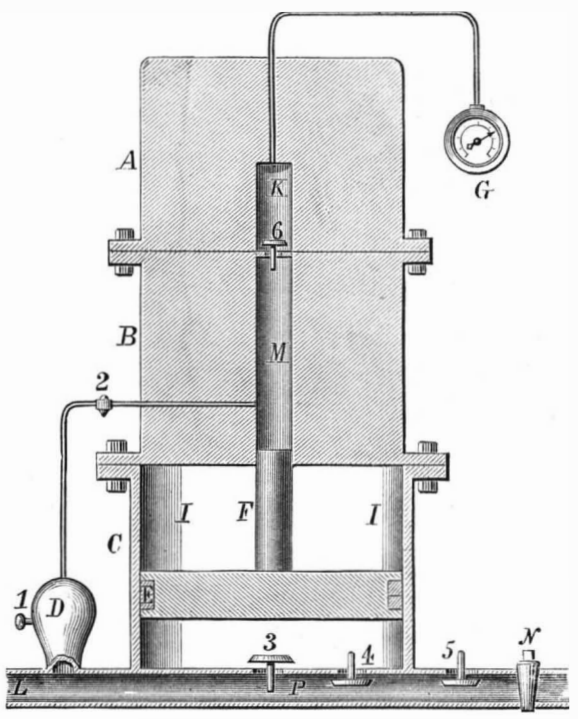
The Keely Motor.

To the Editor of the Scientific American:

The accompanying sketch was prepared at the time the Bailey & Farrell motor came out. I consider the Keely motor a humbug and constructed on the same principle. I do not know that I have hit the Farrell motor or the Keely humbug, in construction; but there is no secret about it, and an apparatus made on this plan will accomplish the same results.

The following is a description of the working of the machine: It is connected to the water main at L; the cock, N, is turned off. As soon as the water is turned on from the main, it will instantly compress the air in the machine in a ratio corresponding to the pressure in the main pipe, and the gauge, G, will so indicate. The cock, N, is now opened, and the machine goes to work automatically as follows: The valves, 4 and 5, are loaded until they will close only when the water has reached its maximum velocity. This would bring the water to a sudden stop if it was not for the valve, 3, which opens and allows the blow to be delivered on the piston, E, forcing the plunger, F, into the chamber, M, displacing the air into the chamber, K, the valve, 6, holds it from escaping. After the blow is spent, the valve 4 opens at the same time valve 5 opens, allowing the water to escape from under the piston, E; the compressed air, I I, driving the piston, E, back to its former position. The air chamber, D, having inlet valve, 1, and outlet valve, 2, furnishes the chamber, M, with a new supply of air for the plunger, F, on its return stroke. The air in the chamber, D, is compressed at the same time the blow is struck on piston, E, it being connected with the pipe, P.

I will suppose for convenience in calculation that the pipe, P, is one inch area, the piston, E, 12 inches diameter, and the plunger, F, ·75 inches diameter. The pressure of the water 30 lbs. per square inch, somewhere near the pressure Mr. Keely used. I may remark the size of the pipe cuts no figure in the case as long as the head of water remains unchanged. Leaving out the coefficient of friction, then we have 30×2·26=67·8 height due to pressure. Then $(\sqrt{67·8×64·3})$=65·1 velocity in feet×12=781·2 inches×0·036=28·1 lbs. of water. We have now 28·1 lbs. of water moving at the rate of 65·1 feet per second; 28·1×65·1=1829+ lbs. effect delivered at the valve 3. But this opening is only 1 inch area. We have therefore 1829 lbs. to the square inch. The piston, E, is 12 inches diameter. D²×7854=113+×1829=206,777



lbs. pressure at the start, decreasing to 113+×30=3390 at the end. Then 206,677 — 3390=203,287÷2=101,643+ lbs. average pressure. But the plunger, F, which delivers this pressure, is only ·75 inches diameter. Again D²×7854=·44+ inches area. We now have 101,643+ lbs. pressure delivered by a plunger of ·44 inches area. Hence 101,643+·44=231,006 lbs. pressure per square inch in the chamber, K. When that gets full it may be removed and another put in its place. This is the theoretical view, but we can throw away half and still have enough left to create that goneness Mr. Keely complains about when one burst. This machine will fulfil all the conditions of the Keely motor.

If the piston, E, is made 21 inches diameter, and the other conditions same as above mentioned, the pressure in K would amount to 693,018 lbs. to the square inch, a pressure which Mr. Keely would likely find trouble in managing.

Frankfort, Ky M. A. JONES.

The Sea in Sahara.

To the Editor of the Scientific American :

Last spring there appeared in the SCIENTIFIC AMERICAN an elaborate and thoughtful article upon the formation of a sea in Sahara. I beg leave to say that the Red Sea, just beside the proposed one, has not evaporated to a bed of salt during some centuries, on account of lack of tributaries; it, like the Mediterranean, has two currents at the strait—an under current of heavy and excessively salt water flowing out of it, and a surface current of ordinarily heavy and salt water flowing into it. Thus the salt is carried out and the sea is prevented from becoming a salt bed. The object of the project is to produce rain in the adjacent lands. Doubtless this effect would be produced. The secondary results would be increased vegetation, a damper soil, and, proportional to the present and contemplated rainfall, less evaporation; hence stream-rivers would be produced, and most of them would flow into the new sea, thus supplying it with fresh water. The number of ports that would be closed by a depression of two feet in the ocean would be small, perhaps none.

T. MARCELLUS MARSHALL.

Glenville, W. Va.

TYPOGRAPHICAL ERRORS.—In a recent number of the *English Workman*, Richard A. Proctor bewails some of his typographical misfortunes. One journal, speaking of his charts of 22,434 fixed stars, made it "chart of 2,243⅓ stars." This mishap he forgives in consideration of the dulness of a compositor's life; but in the following he thinks a severe test of any one's good nature. He wrote of the solar spectra, "lines, stripes, and bands of the violet end of the spectra," which appeared when printed as "links, stripes, and bonds for the violent kind of spectres."

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SCIENCE AT THE BRITISH ASSOCIATION.

THE IDEAL CRIMINAL.

Mr. Francis Galton discussed the ideal criminal, in whom he detects three peculiarities of character: his conscience is almost deficient, his instincts are vicious, and his power of self control is very weak. By the examination of many thousand photographs of criminals, he was enabled, by their physiognomic characteristics, to divide them into three well-marked groups, respectively, of perpetrators of murder, manslaughter, and burglaries, perpetrators of felonies and forgeries, and perpetrators of sexual crimes; and in this way he was enabled to examine how far the peculiarities first mentioned above may be correlated with physical features. The history of the famous Jukes family of criminals was brought forward, to show what extremely important topics may be open to inquiry in a single branch of anthropological research; and the general argument pointed to the necessity of more accurately obtaining explanations of the conditions under which the quality of the stock of the human race deteriorates or improves.

RAILWAY BRAKES.

Mr. E. Woods, C.E., discussed railway brakes, and reviewed the Midland Railway experiments of 1874. His investigations pointed to the following considerations as necessary in view of the provision of perfect brake power for heavy fast trains: 1. The brake power should be applied to all the wheels of the vehicles throughout the trains. 2. The power by which the blocks are forced upon the wheels should be adequate to skidding the wheels upon the speed becoming moderately reduced. 3. The driver should have the whole of the brake power of the train completely under his command, and be able to apply it at a moment's notice, as he is the first person likely to discover any obstruction ahead, and is primarily responsible for the regard of danger signals. He can thus stop the train at once, and no time is lost by his having to signal danger to the guard. 4. The guards should individually possess the like means of applying the continuous brake, that they may be enabled to stop the train without reference to the driver, in an emergency which may have manifested itself to the guard, but of which the driver is unaware—such, for instance, as a broken axle or a carriage getting off the line. 5. The power in hand should be susceptible of easy modulation, that the driver may be able to apply a moderate amount only for effecting ordinary stops, while he keeps in reserve a proper excess of power to be used only in emergencies, as in the contingency of stopping rails. 6. Full brake application should not require more than a very moderate effort on the part of driver or guard. 7. The pressure should be steady and distributed as equally as possible over all the wheels, and acting upon them with the intervention of some elastic medium to prevent too sudden and violent action to occasion the snapping of chains and to inconvenience the passengers. 8. The machinery should be of simple construction, not likely soon to get out of order, and admitting of being easily repaired. 9. Indication should be constantly afforded to driver and guard that the brakes are in proper condition to work or otherwise. 10. A power of working the tender brake and the van brakes by hand, as well as by power, may be advantageously retained. 11. The brakes to be self-acting in case of the severance of the train, and, when severed, the guards to have control over the several portions. 12. Automatic action being provided, means should be furnished to the brake attendants for modifying the action instantaneously, according to the circumstances in which the train may be placed after an accident has occurred. 13. It would be dangerous, and, therefore, inadvisable, to give to passengers any power over the brakes.

AFRICAN EXPLORATION.

Commander Cameron, R. N., the well known African explorer, proposed exploring the continent of Africa through the establishment of trading societies similar to the East Indian and Hudson's Bay Companies; and advocated a system of central stations placed at intervals of from 200 to 250 miles distant. These stations might be turned to account as meteorological observatories, and as depots for botanical and zoölogical collections. He further pointed out that the productive regions of Eastern and Central Africa were capable of bringing forth corn in sufficient abundance to feed the starving millions of overcrowded India.

CHECKING POPULATION.

Dr. Farr said that, according to the most recent calculations, the population of the whole world was now 1,424,000,000. Within certain limits the reduction of mortality has no absolute tendency to accelerate the natural increase of population. Where the death rate reached a much higher pitch, the birth rate no longer kept pace with it; but the diminution of the mortality of England by sanitary improvement was in no danger of multiplying by multiplying men beyond the means of subsistence. Experience proved the contrary, and therefore to keep a population stationary, or to retard national growth, there was needed neither war pestilence nor famine pestilence, nor a war between man and man, but between the lowest forms of life and human life.

MANGANESE MINES IN ITALY.—It may be interesting to the mineral world, and especially to consumers of manganese, that some exceedingly valuable mines have been recently opened in the Val d'Aosta, situated on the sunny side of the Alps. One mine alone, that of St. Marcel, in the lovely Val d'Aosta, is considered capable of producing 50,000 tons a year, and that of Val Tournanche is a clear competitor in the question of richness and capability.

Patent Medicines and Secret Remedies.

The subject of patent and proprietary medicines is an interesting one, and its discussion involves some delicate questions of honesty and ethics. It is one of the most stringent rules of the regular medical profession not to copyright, patent, or keep as a secret any remedy discovered by one of its members. Physicians are supposed to devote their time and strength to the alleviation of suffering among the human family; new discoveries are at once published for the benefit of the race. A man who puts forth any preparation, whose composition he keeps secret, and attempts to profit by the sufferings of others, is denounced by the profession as a *quack*, and a physician will seldom if ever prescribe such remedies, even if they possess merit, which, no doubt, they sometimes do. A credulous community eagerly purchases these widely advertised medicines; and as the profits on them are enormous, they are generally recommended by the druggists, and, as we all know, their sale is immense, as shown by the success of Brandreth, Ayers, Helmbold, and others. In many cases the composition is known by the profession, and hence sometimes they advise their use, but usually the profits charged by the manufacturers render it preferable to administer their contents in another form. In other cases, the manufacturing pharmacists are able to combine several substances to form a neater preparation than can be made by the retail apothecary.

The German chemists are very unmerciful to those who would impose upon the public by worthless preparations; and one Berlin journal, the *Industrie Blätter*, edited by Dr. E. Jacobsen, offers to analyze *gratis* any patent medicine sent to them in the original package. The analyses of over *eleven hundred* such preparations, made by Dr. Hager, Wittstein, Rose, Chandler, Reveil, and others, have been collected together by E. Hahn and published in book-form by J. Springer. A few of these analyses we propose to lay before our readers for their information and amusement, remarking, however, that in some cases it is impossible for the analyst to exactly determine some of the organic remedies, such as gums, balsam, and resins, when in combination or solution, and noting the difficulty of accurate translation of pharmaceutical terms:

Dr. Pierce's Golden Medical Discovery. A one dollar bottle holds 220 grains of a brownish colored clear liquid, consisting of 15 grains pure honey, 1 grain extract of poisonous or acrid lettuce (bot. *herba lactucæ virosæ*), 2 grains laudanum, 100 grains dilute alcohol (64 per cent), tasting like fusel oil and wood spirit, with 105 grains of water.

Dr. Livingston's Ant Balsam, a German remedy, consists of 72 grains castor oil, 2 grains balsam of Peru, and 5 drops oil of bergamot.

American Tooth-ache Drops, made by Majewsky in Warsaw, have different compositions. Those which took the prize at Vienna consisted of common salt and brandy, colored with harmless cochineal red (price, 37½ cts.).

Asthma Pastils (Danl. White & Co., New York), according to the analysis of Dr. Fleck, contain 20·1 per cent salt peter, 3·5 per cent impure scammonium resin, 35·0 per cent gum and sugar, 40 per cent charcoal powder, leaves and stems of some plant.

Ayer's Pills consists of pepper, colocynth, gamboge (*gutti*), and aloes.

Ayer's Hair Vigor, a solution of 0·6 per cent sugar of lead.

Horsford's Baking Powder. One powder contains acid phosphate of lime and magnesia mixed with a certain quantity of flour; the other is bicarbonate of soda.

Berlin Balsam, for cure of all kinds of sores, burns, cuts, wounds, ulcers, chilblains, etc., is nothing but common glycerine contaminated with a considerable amount of chloride of calcium.

Cook's Balsam of Life is a filtered decoction of 20 parts borax in 250 parts water, and 1½ parts pulverized camphor in 1 liter of liquid. Used externally for toothache and all skin diseases.

Brandreth's Pills, says Dr. Hayer, consist of gamboge (*gummi-resinæ guttæ*), podophyllin, inspissated juice of phytolacca, saffron adulterated with yellow root, pulverized cloves and oil of peppermint. The editor states in a foot note that, according to the assertion of two American druggists and one merchant, gamboge is present in Brandreth's Pills, but that the action of the pills does not correspond to this constituent, in which latter assertion we think the editor is slightly mistaken, the pill being really cathartic.

Buckingham's Dye for the Whiskers consists, according to Dr. Schacht, of an ammoniacal solution of lunar caustic, containing 0.5 grammes nitrate of silver, 2·5 grammes aqua ammonia, in 40 grammes of distilled water.

Butter powders seem to be a favorite article of manufacture abroad, and are supposed to aid in making good butter quickly at any season of the year. They consist of bicarbonate of soda (baking soda), colored with turmeric or other less harmless pigment.

Dr. Brown's Chlorodyne contains 5 parts of concentrated muriatic acid, and 10 parts each of ether, chloroform, tincture of cannabis indica (Indian hemp), and tincture of capsicum, 2 parts each of morphine and hydrocyanic acid, part oil of peppermint, 50 parts simple syrup, 3 parts each of tincture of hyoscyamus and tincture of aconite.

Taylor's Concentrated Castor Oil in Gelatin Capsules. They contain real castor oil mixed with 0·5 per cent of croton oil.

Cosmolin and Vaselin are variable mixtures of paraffin with volatile oils. It is the residue left from the distillation of petroleum purified by filtration over animal charcoal, says Miller.

Tobias' Condition Powders contain, says Schädler, 2 grammes tartar emetic, 20 grammes black sulphide of antimony, 10 grammes sulphur, 10 grammes saltpeter, 40 grammes fœnum græcum, and 20 grammes juniper berries.

Eau de la Floride contains, according to Eymael, 50 parts sugar of lead, 20 parts sulphur, and 1,000 parts distilled water.

Eau de Quinine, a favorite hair wash that is much used in Berlin and Leipzig, contains 2 grammes balsam of Peru, 6 grammes castor oil, 60 grammes rum, 35 grammes water, 5 grammes tincture of red chinchona. Its constituents are at least harmless, which can be said of but few of our American preparations for the hair.

English Patent Washing Crystals; 6 parts water glass, 29 parts calcined soda ash, 60 parts bicarbonate of soda, 5 parts water.

Buehligen's Depilatory. A mixture of 2 or 3 parts sulphide of arsenic with 15 parts pulverized quicklime.

Bucher's Fire Extinguishing Powder contains 59 parts saltpeter, 36 of sulphur, 4 of charcoal, 1 of oxide of iron. We fail to see the advantage of this peculiar sort of impure gunpowder as a fire extinguisher.

Non-poisonous (?) Fly Paper, from Bergmann & Co., in Rochlitz, contains a large amount of arsenic!

Iodine Cigars, from J. D. Tormin, in Stettin, bear the motto "No more phthisic;" but contain no trace of iodine. Can the Yankees beat that?

Hamburger Tea contains 32 parts of senna leaves, 16 of manna, 8 of coriander, and 1 of tartaric acid, ground up together.

Dr. Sage's Catarrh Remedy, says Schädler, contains 0·5 grammes of carbolic acid, 0·5 grammes camphor, and 10 grammes common salt, which are to be dissolved in ½ liter of water, and injected into the nostrils. It appears very probable that the wide reputation of this remedy is a deserved one, and thepublication of its constituents will rather increase than retard its sale.

Croup Powder, from F. W. Gruse, in Berlin, contains 25 parts of common salt, 10 of flowers of sulphur, 25 of fœnum græcum, 25 of juniper berries, 5 of gentian root, and 5 of fennel seed.

Horn's Liton, infallible cure for tooth-ache, contains 5 parts of phosphate of lithia dissolved in 400 parts of alcohol.

Schenk's Mandrake Pills. Hager says that these pills contain no mandrake. They do contain the constituents of cayenne pepper, a bitter extract, and some vegetable powder containing tannin.

Bishop's Granular Effervescent Citrate of Magnesia. According to Löhlein, it contains neither citric acid nor magnesia, but is merely a mixture of bicarbonate of soda and tartaric acid.

Poho, a Chinese essence for headache, etc., consists, according to Hager, of good and pure peppermint oil, rather hard and resinous. According to others it is a mixture of Epsom salts and peppermint oil, or of the latter with oil of almonds.

R. R. R. consists of a reddish-yellow liquid, that smells of ammonia and camphor. It contains 14 parts soap, 40 parts of 10 per cent ammonia, 640 parts alcoholic extract of cayenne or Spanish pepper, 4 parts camphor, and 2 parts rosmarin oil.

Selenite Perfectionné, from Paris, for dyeing the hair, is an alkaline solution of acetate and nitrate of lead.

Mrs. Winslow's Soothing Syrup consists, says Hager, of 8 parts of white simple syrup mixed with 1 part of a tincture made by extracting 10 parts of freshly crushed fennel seed and part of oil of fennel with 60 per cent of spirits.

Sozodont for the Teeth. The reddish liquid consists of a solution of 5 grammes oil soap in 6 grammes glycerin, 30 grammes spirits, 20 grammes of water, perfumed with a few drops of oil of peppermint, oil of cloves, oil of cinnamon, and oil of anise, and colored with cochineal. The powder is a mixture of carbonate of lime, magnesia, and Florentine orris root. None of the ingredients can be considered objectionable.

Worm Lozenges. A favorite American remedy. It contains 1 part calomel, 6 parts santonine, and 290 parts sugar.

World's Hair Restorer contains, says Wittstein, 5·6 grains sulphur, 8 grammes sugar of lead, 100 grammes glycerin, and 200 grammes aromatic perfumed water.

Extract of Walnut Shells. A preparation with this harmless appellation is put up by a Berlin firm; but it contains, according to Schädler, a little nitrate of silver and chromate of copper in ammoniacal water.

The above are but a few specimens, selected to show that humbugs are pretty equally distributed over the earth's surface, including China, while at the same time we are pleased to notice that some of our American preparations are totally harmless, while others are even useful and beneficial. We hope at the same time to have satisfied a pardonable curiosity in some of our readers.

POLISHING BRASS.—For polishing the brass work of engines, rub the surface of the metal with rottenstone and sweet oil, then rub off with a piece of cotton flannel and polish with soft leather. A solution of oxalic acid rubber over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

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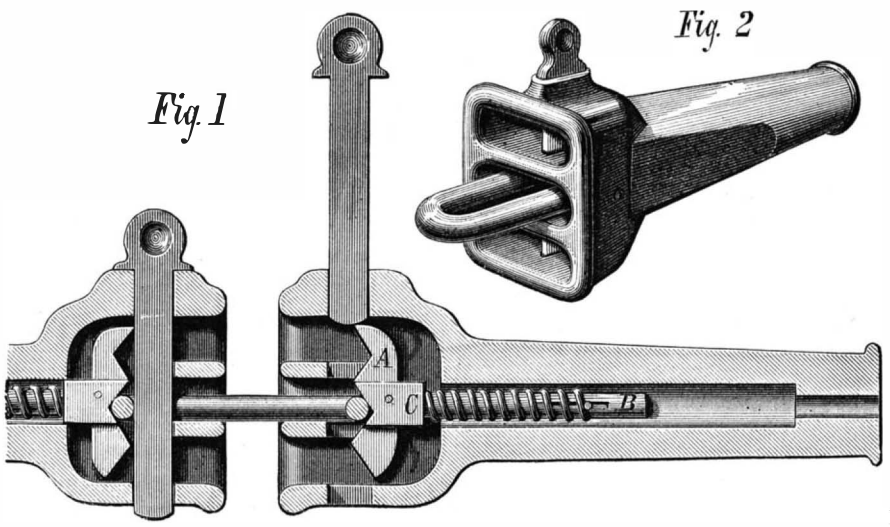
IMPROVED CAR COUPLING.

The invention herewith illustrated is adapted to coupling cars of different heights, automatically and by means of the common form of short link. The construction is such that the link is always maintained in proper horizontal position for entering the drawbar of the opposite car.

The drawbar, as shown in Fig. 2, is divided into three compartments, and through the same are made apertures for the reception of the pin. A is a crosshead having a stem, B. The latter is enveloped in a spiral spring and moves in a central longitudinal recess of the drawbar. Said recess opens into the central throat and is of sufficient diameter to receive the shoulder, C, of the stem. The spring bears against this shoulder, and also against a pin which is fixed in the sides of the drawbar, and passes through a slot in the stem. The pin thus serves as an abutment for the spring, a guide for the stem, and a stop to limit the forward movement of the crosshead, A, so that the latter simply advanced to its proper position beneath the coupling pin without striking any of the partitions and thus becoming, in time, worn. The drawbar is recessed to receive the crosshead, which is secured to the stem by dovetailing. To make this attachment the stem is first inserted into its position by passing it longitudinally through the middle throat until its dovetail slot is immediately below the coupling pin hole. The crosshead is then passed down through said hole and then driven into the dovetail slot, where it is suitably secured by screw or rivet. The advantage claimed for this construction is that the narrow shape of the crosshead permits the drawhead to be made more nearly solid and stronger; while the mode of connecting the crosshead to its stem preserves the usual shape of drawbar close to the head, and allows of its being made in one piece. The forward side of the crosshead has beveled faces, which press upon the link and force its inner end down, thus holding the link in proper position for entering the opposite drawbar, as shown in Fig. 1. The link is not rigidly held after coupling, but moves freely up and down, so that it accommodates itself to the varying position of the cars.



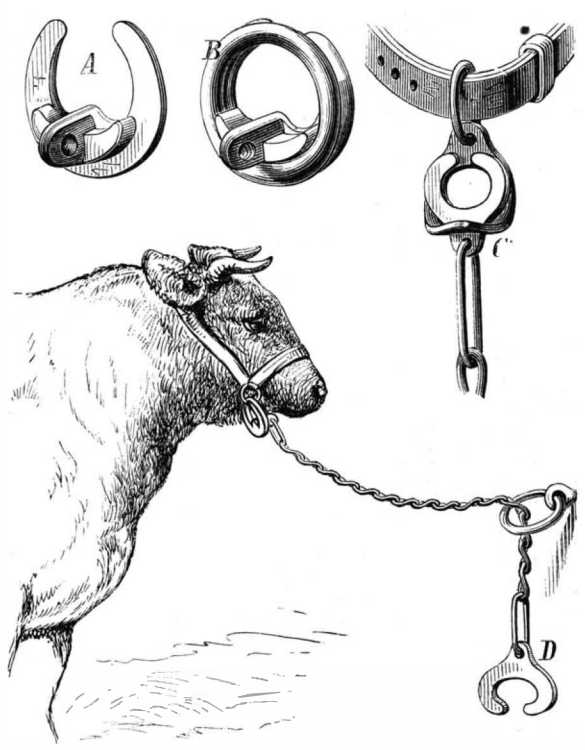
HEAVENER'S IMPROVED CAR COUPLING.

In using the device, the coupling pin is supported upon the end of the crosshead, as shown in Fig. 1. The entering link pushes the crosshead to the rear, and causes the pin to drop through the link opening, so coupling the cars.

Patent pending through the Scientific American Patent Agency. For further information address the the inventor, Mr. I. Floyd Heavener, Laramie City, Albany county, Wyoming Territory.

DILLON'S HALTER CHAIN, AND TRACE COUPLING.

Mr. John C. Dillon, while Farm Superintendent of the Massachusetts Agricultural College, had in his charge, among other stock, several adult bulls; and, after considerable experience with knobs, buckles, hooks, snaps, and toggles, he became convinced of the need of some new method of fastening these animals, which should be at once simple, easy of operation, strong, durable, and absolutely secure. These conditions, he claims, are combined in the device shown in the engraving.



It consists in a crescent-shaped hook, A, and a ring, B. The hook is slipped into the ring, as shown, forming a coupling which can be operated instantly and easily, which cannot be accidentally detached, and which, not being dependent on any screw or spring, is as strong and durable as the ordinary links of a chain.

By bending up the coupling ring, on the chord of an arc of it, as shown at C, or by using a coupler with the shank perpendicular to its perimeter, as at D, the coupler is made to lie flat in its ring. This coupling, we are informed, has been used with much satisfaction on halters, cow chains, traces, breechings, pole straps, and wood chains. It is also adapted to a variety of other uses, such as satchels, shot belts, fishing-baskets, skirt-supporters, etc.

The following are some of the advantages claimed for the coupling when applied to halters, and will be readily understood by reference to the engravings. It serves as a safe, handy, and durable method of connecting the halter chain or rope with the head-stall, and also with the manger ring or other hitching place. The weight of the lower coupler prevents any slack in the rope or chain between the horse or other animal and the manger ring, and materially lessens the danger of casting or entanglement. It has also been found to succeed well with horses which were noted for their skill in untieing knots. As the chain or rope swings loosely and turns freely in the manger ring, it cannot become twisted. The necessity for constant care and thought as to the proper length for tying up is avoided. When the head-stall is taken off and left attached to the rope or chain, the weight of the lower coupler holds it suspended against the manger, instead of allowing it to lie in the manger or on the floor.

This invention was patented in the United States July 3, 1877, and in Canada July 18, 1877, by John C. Dillon, of Amherst, Mass., to whom engineers are referred.

THE COLORADO POTATO-BEETLE IN EUROPE.—GERMAN THOROUGHNESS.

BY PROFESSOR C. V. RILEY.

When, a few years since, the writer first announced his conviction that there was real danger of the importation of the above named insect from our Atlantic shores into the potato-growing countries of Europe, he was considered an alarmist by most transatlantic and by some American writers; while there were not wanting those of high entomological authority who made out, to their own satisfaction, the impossibility of the insect's thriving and multiplying in a climate differing in so many respects from that of its native home. Time has, unfortunately, but too surely vindicated my position and established the possibility not only of the insect's importation but of its ready acclimation. The occurrence of a living beetle in the Bremen docks during the summer of 1876, in a cargo from New York, was the first evidence we had of the importation so much feared; and, as the sequel has shown, others, unnoticed, must have been carried to other parts of Germany that year.

The discovery of the pest in all stages at Mülheim, on the Rhein near Cologne, during the latter part of last June, was considered of sufficient importance to be telegraphed and cabled to all parts of the world; while the energetic measures adopted by the Minister of Agriculture to stamp it out have been made known. The name of *Doryphora* 10-*lineata* has lately become as familiar to the members of the British Parliament, the German Diet, and the French Assembly as have the less pronounceable names of the towns and passes over which the Turks and Russians have had their more sanguinary conflicts. But it is not my purpose to dwell on the fact of the insect's successful establishment on another continent, notwithstanding the efforts made to prevent such an occurrence. I desire, rather, to call attention to, and to commend the thorough methods adopted to eradicate the evil. The authorities, not satisfied with causing the field of potatoes in which the insects were found to be covered with sawdust, saturated with coal oil, and burned, had the good sense, in addition, to send to the scene of action Professor A. Gerstaecker, of Greifswald, a well known entomologist connected with the Berlin Museum, in order that he might examine and report. When he arrived, the potato field in question and several adjacent fields toward Deutz were already in flames, under the management of Alderman V. Nieswand and Mayor Steinkopf. Fortunately, these gentlemen had saved some of the larvæ and the beetles taken from the field, and had preserved them in well secured bottles. Those commissioned to perform the work of extermination by burning took it for granted that the beetles were fresh from America, and had produced the larvæ. They would very naturally have concluded their labors and rested satisfied in the conviction that no *doryphora* had by any possibility escaped from the fiery ordeal it was subjected to. Not so the deeper sighted entomologist! From analogy in other beetles of the family, and from what American authors had written, Gerstæcker took in the situation at a glance. The pale and fresh color of the beetles and the full grown condition of some of the larvæ indicated that the former were recently from the pupa, and suggested that there might be transforming larvæ and pupæ some inches below ground and unaffected by the superficial fire.

At his solicitation the field was plowed, but without result. No insects were noticed. With faith in the accuracy of his deductions, he still bade the authorities persist, and twelve laborers, in line, commenced turning over the earth foot by foot with the spade. For the first hour this also seemed futile; but as soon as the spot was reached where the larvæ were first observed, one pupa after another was turned up, with here and there a larva not yet transformed. In a few hours over sixty had been found, all alive and some just ready to give forth the beetle. This effort of the German Government to strike effectually at the root of a threatening evil, instead of waiting until it was ramified in all directions, and then spending vast sums in vain attempts to counteract it, furnishes a beautiful illustration of two very plain and simple truths in economic entomol ogy that are too often overlooked. These are, first, that prevention is so much more satisfactory than cure; second, that thorough and special knowledge is necessary in successful warfare against injurious insects.

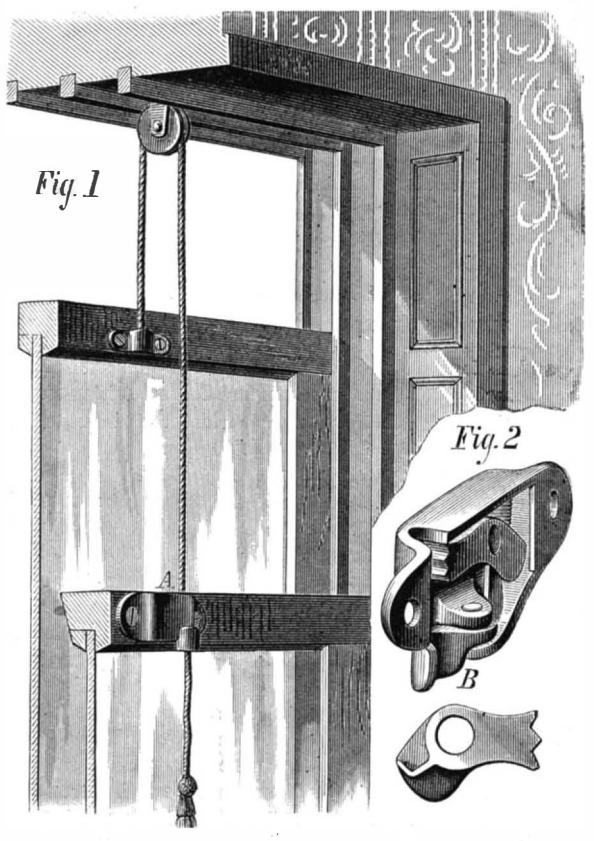
It is doubtful if the thorough measures above described have eradicated the evil in Germany, because the insects found at Mühlheim were probably the progeny of a single beetle that went over last year, and other females may have got a foothold in other parts of the empire; but a nation which will use such vigilance and thoroughness in one instance will be apt to do so when occasion again presents.

IMPROVED SASH BALANCE.

We illustrate herewith a simple device whereby the two sashes of a window are caused to balance each other, so that either may be adjusted independently in any position, or both may be moved together.

The fastener, A, Fig. 1, is secured to the meeting rail of the lower sash. The cord is attached to the top rail of the upper sash, passes over a pulley on the window casing, and down through the fastener. The latter is represented in detail in Fig. 1. It consists simply of a spring-acted toothed clamp which clasps the cord. In contact with one arm of the clamp is a pivoted lever, B, which, when the lower portion or tassel of the cord is pulled outwards, acts on the clamp so as to cause the latter to release its clutch on the cord.

When the lower sash is raised the upper one will descend. If it be desired that both sashes shall remain up, then the lower one is first raised and held in position by the left



hand. The cord is pulled outward to release the catch, when it will render through the fastener, thus lifting the outer sash. Similarly to lower the inner sash another pull on the cord releases the fastener, when the sash may be slowly lowered. The movement of the sash may be arrested at any point by simply bringing the cord straight. Patented June 26, 1877. For further information address the inventors, Messrs. Kolb and Osberghaus, Sandusky, Ohio.

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THE BIRDS OF PARADISE.

When the Portuguese discovered the Molucca Islands they found there dried birds' skins of so beautiful and strange an appearance as to call forth the admiration of those gold-seeking navigators. The Malay dealers called them *Manuk-Dewata*, or "Birds of the Gods," which was translated by the Portuguese as *Passaras da Sol*. The Mohammedan conquerors of that country invented the legend that these birds, which nobody had then seen alive, came from Paradise, that they lived exclusively in the air and never alighted on the earth. Speculation added to this story that these birds had neither feet nor wings, and the dried skins which were brought to Europe strengthened this belief, as the wings and feet were really wanting, having been removed by the natives.

Antonio Pigafetta, who took part under Magellan in the first circumnavigation of the globe, and who returned in the year 1522 to Spain, relates in his diary that Bachiun, the ruler of the Molucca Islands, had given them two very beautiful dead birds as a present to the King of Spain. These birds were, according to Pigafetta, about the size of pigeons, had small heads, long bills, legs as thin as a quill and as long as a hand. They had no wings, but in place thereof long feathers of different colors, similar to large plumes. It thus appears that Pigafetta had given, shortly after the discovery of the Moluccas, a truthful description of the bird of Paradise, but the prejudice of the times in favor of the supernatural did not accept his statement. All the skins brought to Europe were without feet, and therefore Pigafetta must be in error. Such was the conclusion of the naturalists of the 16th and partly of the 17th century.

Though the home of the bird of Paradise had been discovered about the year 1512, and was frequently visited by the Portuguese and other European navigators, no reliable information was obtained concerning them. The knowledge of the coast of the country was only of a hydrographic nature, as into the interior no European foot had as yet penetrated. Only in the third score of this century careful and reliable information of the bird was obtained through the efforts of the French physician and naturalist, Lesson, who was stationed during his circumnavigation of the earth in the harbor of Dorey, and who secured about a dozen well preserved skins. Additional information was furnished after 1860, by the Dutch traveler, G. v. Rosenberg, and by the English traveler, A. R. Wallace, who remained for a period of five years in the Malayan archipelago.

The bill of the bird of Paradise resembles that of the crow, and the bird has been placed by naturalists in the same class. Not even the humming bird of tropical America surpass these crow-like birds of the Moluccas in the metallic hue of their colors. With many of them, long tufts of delicate feathers extend from the sides of the wings, forming long fan-shaped tails; with others the breast feathers spread like shields of enamel, while the neck feathers form fantastic collars. Besides these, two long thread-like feathers extend far beyond the remaining tail feathers; and similar accessory feathers, as they have been called, extend from the head, back, and shoulders. The species *paradisea* is recognized by largely developed, plume-like feathers that grow out from below the wings. The so-called feetless bird of Paradise is the largest of the class and species. Body, wings, and tail are coffee-brown, head and neck of a velvety-yellow, the breast and front head of emerald green. The two long middle feathers of the tail form spiral windings, like wires, from two to three feet in length. At the sides, below the wings, is a heavy bundle of delicate orange-colored feathers, with whitish ends, which are tinted with a brownish-red. This bundle of feathers may be instantly raised and spread so as to surround the body of the bird like a halo.

The Papuan bird of Paradise is somewhat smaller than the one described, but very much resembles it. It differs by being of a brighter brown and a deeper yellow color, which extends over the entire upper part of the back and over the coverings of the wings, another difference being the terminating of the bundles of orange feathers in a clear white. The beautiful plumage is a characteristic of the male only, the female being with very plain plumage. It has neither the long downless feathers of the tail, nor even a single yellow or green feather on the head. The young males are, in the first year, like the female, and only after four years of age does the bird assume his entire brilliant plumage.

The birds of Paradise are very lively and continually in motion. Their voice sounds like a long "wak, wak" or "wok, wok," and can be heard quite a distance. It is not known how they build their nests. They live on fruits and insects.

The natives obtain the birds in different ways. As soon as they find a tree that serves as their meeting place they build a shelter of palm leaves among the branches, where the hunter hides himself before break of day. A boy is in waiting at the foot of the tree. As the birds congregate, the hunter shoots the birds with an arrow that has a blunt point. As the birds drop they are caught and killed by the boy. The birds are prepared by the natives in the following manner: The wing feathers are drawn out and the legs cut off, the skin is drawn over the body to the bill, and the brains then taken out. A round stick, that extends for a few inches from the bill, is inserted in the skin, and the same dried in the smoke in their huts.

The first live birds were brought to Europe by Wallace, in 1862, who bought them at Singapore for £200 sterling. The larger kind, with one species of a smaller kind, was brought alive to Europe for the first time in the summer of 1875. Both birds were obtained by the Berlin Zoölogical Garden.

BIRDS OF PARADISE.

Intellectual Culture of Parrots.

W. B. Cooper, of Philadelphia, suggests the idea of taking advantage of the remarkable facility of imitating speech which parrots possess, and endeavoring to educate them by "intellectual environment" of the race for several generations. He thinks some very interesting results may be obtained within a very limited period; and that as they often repeat words, the meaning of which they do not comprehend, is no argument that they may not be taught their meaning. His idea is to collect a number of the most intellectual parrots of both sexes, give them daily object lessons, removing the stupid ones from the next generation, and so with succeeding ones. By this method the advantage of hereditary effect by having them present at the lessons. would be secured, and the rising generation would have an opportunity of profiting by the experience of their ancestors.

Another New Iron Steamer.

On the 30th August the new steamer City of Washington, for the Havana trade, was launched from Roach's establishment, Chester, Pa. Length, 321 feet; breadth of beam, 38 feet; depth, from spar deck, 35 feet, and from hurricane deck, 28 feet. Her hull is of iron, the plating being riveted throughout in boiler fashion. The plates vary from five eighths of an inch to an inch and a quarter in thickness. Her deck houses near the machinery and the galley are to be of iron, while the others will be constructed of wood. The spar deck is of iron, covered with wood for the entire length and breadth of the vessel. The lower deck abreast of the space occupied by the machinery is also of iron.

The engines were made by the Morgan Iron Works, New York city. They are of the compound pattern, the high pressure cylinder having a diameter of 40 inches, and the low pressure one of 74 inches. The stroke of the piston is six feet. The boilers, two in number, have each a diameter of 17 feet, and a height of 20 feet. The steam pressure will be 80 lbs. to the square inch. The propeller has a diameter of 16 feet, with a pitch of 24 feet. The City of Washington is expected to average 15½ knots per hour, and when her engine is driven so that the shaft makes 75 revolutions per minute, it is thought she will be able to make between 17 and 18 knots.

How to Make Old Steel Pens Good as New.

A subscriber says a pen scratches because the inside corners wear off, and look like the bottom of a M. To restore it, rub the end

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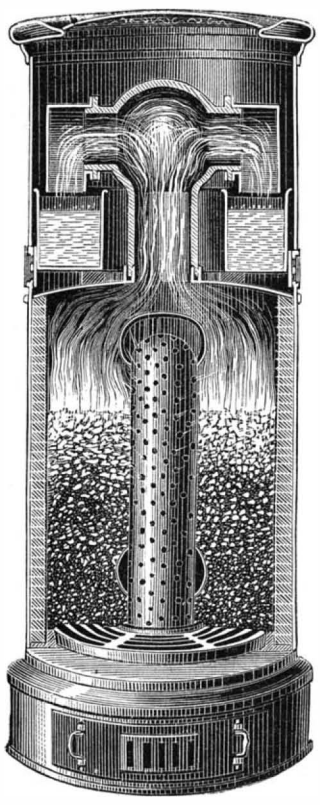
square and even on a whetstone. Bring the slope of the nib to a point to suit you. Then, holding the pen nearly upright, roll it around, holding the nib on the stone to make the point round. Make it as round and smooth as you can.

A CHIMNEYLESS STOVE.

M. Mousseron, of Paris, has recently devised the novel form of stove represented in the annexed engraving, the chief peculiarity of which is that no chimney is required for It. It makes its own draft, and is consequently portable. Rising from the grate is a perforated tube, through which, as well as through the interstices of the grate bars, the air enters and passes through the coal. This, it is stated, produces such thorough combustion that the formation of carbonic oxide is prevented and the carbon is wholly converted into carbonic acid. Carbonic oxide is essentially mephitic and deleterious, and a small percentage in the atmosphere is sufficient to produce highly injurious effects. Carbonic acid, on the other hand, while irrespirable, is not poisonous, so that any stove performs its most important duty when it obviates the generation of the gas first mentioned.



The products of combustion arising from the coal are led up through a flue and then conducted downward so that they come in contact with water contained in an annular vessel surrounding said flue. This water never boils, and vaporization is confined to its surface, producing an internal movement of rotation, the result of which is that the gas, etc., from the fuel becomes thoroughly mingled and saturated with the water. On rising, the gas meets the curved cover, and is once more deflected downward, again meets the water, and finally escapes into the atmosphere by side orifices provided for that purpose. In this way it is claimed that the carbonic acid becomes intimately mixed and dissolved in the water, so such as is contained in the escaping vapor is not in a condition to injure the air for respiration.

From the records of experiments we learn that in three hours 2·2 lbs. of charcoal and 6·6 lbs. of coke were consumed. At the end of an hour the air in the room, measuring 4,805 cubic feet, was analyzed with the following result: Carbonic acid, 0·375; carbonic oxide, 0·003; oxygen, by calculation, 20·6; nitrogen, by same, 79. Total, 99·978. With regard to quantity of fuel employed for a given space to be heated, it was determined that the initial temperature being 32° Fah., in order to heat 327 cubic feet of air to 60° Fah. from 1·1 to 2.2 lbs. of fuel were required, while ordinary stoves, under like conditions, necessitated from 4·4 to 8·8 lbs.

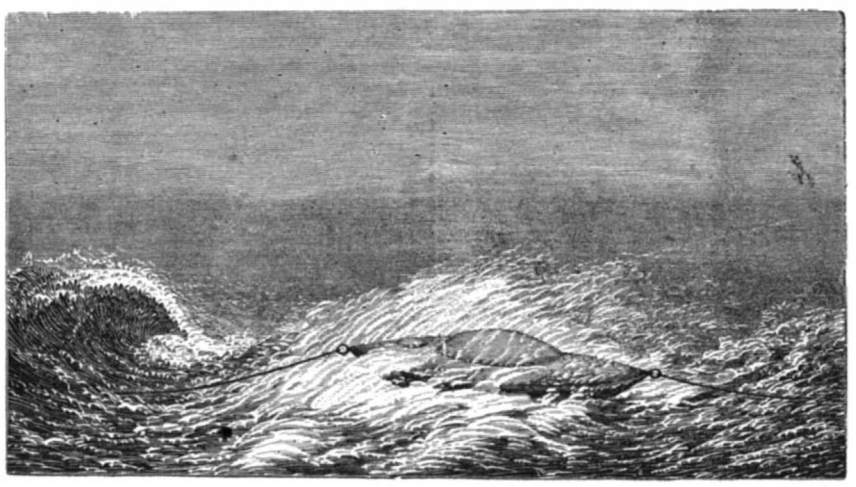
THE AMERICAN LIFE SAVER OR SURF CAR.

Nothing of consequence was accomplished to lessen the loss of life occasioned by shipwreck until the year 1848, when Captain Douglas Ottinger, of the United States Revenue Marine, presented to the world his "life car." No sooner was the invention introduced than the American Government acknowledged its fitness for the purpose intended, and ordered the life-saving stations along the Atlantic coast each to be provided with one of these cars.

Although so useful, the car is simplicity itself, and its construction such that it may easily be understood. It is made of galvanized sheet iron. In length it is about nine feet and in breadth three and a half. Outwardly it looks much as we would imagine one of our common clinker-built boats to appear if it had a slightly curved cover placed upon it. Instead of having a stern and stem, the ends are alike, both terminating in a point. Nearly in the center of the top is an air chamber, designed for the purpose of righting the car should it turn over. In shape this resembles a hemispheroid, and it is about two and a half feet in length, and ten inches in breath. Between its end and the further extremity of the car is the entrance. Water is prevented from coming through this by means of a lid securely fastened. Around the circumference of the car a thick rubber band is placed to protect it from damage in case of contact with hard substances. Above and parallel to this is a rope. It is intended for drowning persons to grasp in order that they may be drawn ashore.

The inside of this curious life-preserver is divided into three separate apartments. Those at the ends are merely air chambers, and are both about one and a half feet in length. Between these is located that portion of the air designed for occupants. Although this space may seem small, in order to prove its capacity it is only necessary to state that it has accommodated a woman and six children, and that three men can get into it without any difficulty. "How can the car be sent to a vessel during a storm, and especially if it be two thirds of a mile away?" is the question which naturally arises at this point. It has been done and in the following manner: The smallest cord capable of sustaining the force brought to bear upon it is fastened to a copper wire which is bent in form of a spring (to lessen the momentum), and attached to a twenty pound cannon ball. By firing this over a sinking vessel, those on board can grasp the cord. With this, a small rope is drawn in and so on until finally the car itself reaches the vessel. In the meantime, those sending the assistance keep their hold of the car by means of another rope. In this way they can pull it back. If once successful, all further trouble is at an end, because the main difficulty lies in getting the rope to the distressed ship. When this is accomplished both parties can retain their own rope, and thus the car may be drawn back and forth without delay. By working continually, fifty lives can be saved in an hour.

Thus does the usefulness and simplicity of the car combine to make it one of the most perfect life savers yet invented. Although recently introduced it still has a record, and a glorious one, as it has already rescued over four thousand persons from inevitable death. Its celebrity, however, is not bound by two oceans. France, ever on the alert for improvements, soon seized this, and her accounts of its perfections are exceedingly flattering, and are sufficient to cause America to be justly proud that one of her sons invented the life car.



THE AMERICAN LIFE SAVER OR SURF CAR.

Germ Destruction by Concussion.

Mrs. H. K. Ingram, of Edgefield, Tenn., proposes to kill germs by concussion of the air, and in a paper read before the American Association at Nashville, she explained her theory. It is well known that many dreaded pestilences are transmitted by living organisms which, floating in the air, are inhaled and so find entrance into the body. Mrs. Ingram points out that all the mosquitoes in a room can be killed by exploding in the center of the apartment a small quantity of gunpowder, and from her experiments she is led to believe that similar explosions might be used to kill the phylloxera on grape vines.

There is nothing new in the general idea of destroying lives by concussion, although the application of the same to the extermination of the minute organisms which generate disease is in itself a novel proposition. During the late war two attempts were made by the Federal forces to destroy large numbers of the enemy once by the explosion of a heavily charged mine and once by loading a vessel with powder, etc., and blowing her up under the walls of a fort. Neither were successful.

Mrs. Ingram's proposition suggests the plan frequently broached of firing heavy guns to provoke rain, and shows that such explosions may prove of double benefit.

Coloring Wool.

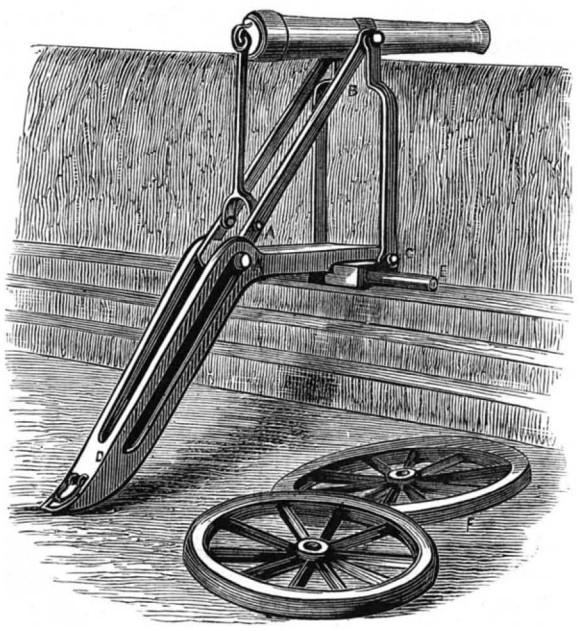
It is pointed out in Reimann's *Färber Zeitung* that fabrics, especially those of wool, which have for a long time been exposed to air and light, acquire a stronger power of fixing coloring matter than portions of the same material which have been kept in the dark. This circumstance often prevents the production of an even shade, those parts on which the light had fallen taking the light more readily and acquiring a striped or banded appearance.

TRIAL OF MILITARY APPLIANCES.

At a recent field day of the Royal Engineers, Chatham, England, a variety of exercises in practical military operations were performed, and trials made of improved batteries and other war appliances.

The chief features of interest in the siege works were as follows: First, the batteries, built a little in rear of each trench, so as to utilize the trench parapet as a screen to receive the enemy's fire instead of the parapet proper, and to mislead them. These batteries had the narrow soda-water bottle form of embrasure, with sides protected by means of hides. On the gun carriages were hung the so-called Prussian scale slides, for laying guns by reference to a line passing longitudinally under the carriage. The two scales having corresponding graduations, and being of considerable length, enable the gun to be laid without much traversing. For example, if a gun moves laterally in firing, it is immaterial whether the line on the platform beneath it corresponds to a 1 on the front scale and a 3 on the rear, or a 4 on the front scale and a 6 on the rear, the same inclination between the axis of the gun and the platform line being obviously maintained.

There was rather an ingenious device of Major Maquay's for enabling a field gun to fire over any part of a trench, consisting of a framework carriage of iron, on which the gun was mounted, which, by means of a parallel bar movement, descended under cover on firing. Wheels could be put on and the gun moved from point to point as might be desired.



MAQUAY'S BREASTWORK CANNON.

The trench tramway had carriages for carrying ammunition, guns, and carriages, or wounded along it.

There were examples of the newest forms of blinded trench and of splinter-proof cover, etc. On the salient of the new ravelin was an imitation of an iron-plated battery for three guns, the extreme angle of the salient being rounded off to admit of fire along the capital. In the modern system, it may be remembered that the space in front of the salient of the ravelin, that is to say, along its capital, is defended by direct fire, but that in front of the salients of the bastions by oblique fire, consequently there was no deficiency when the range of guns was short. In these days a spot can be found where the lines of fire have crossed each other which is within easy range of rifled guns; hence there exists a special necessity for fire being provided along the capitals of salients, although that does not apply to the case of the particular one in question. The iron work in question ought to be a very valuable one, both from its commanding position and from the complete protection afforded to the guns. It would be necessary, however, to have very thick armor for such a work, which, if it is liable to receive the fire only of much lighter guns than an armor-clad ship or coast battery, would be the constant mark of numbers of siege guns which would have the range accurately. Railway iron was used for the flank protection of splinter-proofs in places; but there are no examples of the concrete that proved so effectual last autumn. The steam sappers were the chief features of interest in the marching past. An 8 horse power steam sapper came by, drawing three 32 pounder smooth-bore guns on traveling carriages; a 6 horse power engine, four bronze guns of position—heavy 12 pounders and 32 pounder howitzers. Others drew loads of shot and shell, cases of arms, and materials for the engineer parks.

A Horned Rattlesnake.

An inhabitant of Burnt Chimney, Rutherford county, was in the city yesterday evening, exhibiting five rattlesnakes, one of which had genuine horns. The horns project perpendicularly from the snake's head, and are about an inch long. They are of a brownish color, and in shape and general appearance are exactly like those of a deer, with the difference that they are less crooked, and larger in proportion at the point at which they emerge from the head. The snake is about eight years of age, and in every other respect is perfect.

The owner of the phenomenal snake says that it was caught on Black Mountain, in McDowell county, about a month ago. He and several others had heard of a famous rattlesnake den there, and went for the purpose of shooting them. When they found it several hundred snakes were visible, among them the one with horns. Before they began shooting they captured a half dozen or more by means of nooses, taking the horny headed one first.—*Charlotte (N. C.) Observer.*

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SCIENCE AT THE BRITISH ASSOCIATION.

We continue below our brief abstracts of the more important papers read at the recent session of the British Association at Plymouth, England.

EXPERIMENTS ON THE ELASTICIY OF WIRE

have been begun in the University of Glasgow. Thus far the investigation has extended to the effect of continued application of force on the breaking weight of steel wire and soft iron wire. It is found that, when a weight nearly as great as the breaking weight is kept for a long time—several days for instance—and applied to pull out a soft iron wire, the effect is to increase the strength of the wire as much as 6 or 7 per cent. The

CONDITIONS UNDER WHICH LIQUID CARBONIC ACID EXISTS IN MINERALS

was the subject of a paper by Mr. W. N. Hartley. A method was described of determining the exact temperature at which the carbonic acid sometimes found inclosed in minerals becomes gaseous. This has been determined to be 30° 92 C. The investigation has led to some interesting results concerning the motions of the bubbles in fluid cavities when influenced by heat. Bubbles in certain cavities approach the heated source, in other cavities they recede. A rise of temperature of 5° C. causes apparent attraction, while a rise of ½° C. in some cases causes repulsion. In certain cases a bubble which receded from the source of heat at ordinary temperatures approached it when raised to 60° C., the source of heat always being from ½° C. to 5° warmer than the specimen. Mr. Hartley has also examined a remarkable vibration of minute bubbles in fluid cavities. It was found that these bubbles approached a warm body brought near them, and that they ceased moving and clung for some time to the warmer side of the cavity. The conclusion arrived at for these phenomena is that an easily movable particle, which can be set in motion by exceedingly slight differences in temperature, will make the transference of heat from one point to another plainly visible. The minute bubbles in the cavities are such particles, and these vibrator motions afford ocular demonstration of the continual passage of heat through solid substances.

Mr. Silvanus P. Thomson, discussing

BINOCULAR AND MONOCULAR VISION,

stated that light is more powerful in producing an effect when concentrated upon one eye than when equally distributed to the two, though according to what law experiments are not yet sufficiently numerous or exact to determine; but, on the other hand, the light so concentrated on one eye does not produce the sensation of twice as much illumination as the half of the light viewed by both eyes at once.

TEMPERATURE COEFFICIENTS OF INSULATING ENVELOPES.

Mr. Bruce Warren had already shown that the rate of variation in the insulation resistance of a core or cable under changes of temperature could be determined for any period of contact. He now points out that an important consequence of the phenomenon of electrification being reducible to an intelligible variation is that we can calculate not only the changes in the resistance due to variation of temperature, but we can ascertain with the same precision any required change due to prolonged contract at any required temperature. It also appears that electrification, which is an inseparable property of all insulators, follows some law of variation in which the temperature coefficient of the insulator itself is a function.

ACTION OF FATTY OILS ON COPPER.

Mr. W. H. Watson stated that paraffin and castor oils have the least action upon copper, whilst the action of sperm and seal oil is slight. Linseed, olive, almond, colza, sesame, and neatsfoot oils all act considerably upon copper, the action of linseed oil being especially great. The author concludes that the comparative action of different oils cannot in all cases be decided upon from the appearance of the oils after exposure to copper plates, though minute quantities of the metal may be easily detected in most oils from the color produced.

CHANGES IN CANDLES PRODUCED BY SEA WATER.

Professor Gladstone had examined some candles taken from the wreck of a Spanish vessel which had been submerged for 173 years. The fat had been converted mainly into calcium and sodium salts. Although, however, the fats have been in contact with a practically unlimited quantity of sea water for the above lengthy period, and a chemical change between them has been possible, the double decomposition has proceeded so slowly that the reaction is only about half completed at the present time.

CONSTITUTION OF ARCTIC COAL.

Mr. T. Wills has examined some coal from the side of a mountain gorge about two miles from Discovery Bay. By comparing the results of an analysis with those of obtained from another analysis of a mixture of specimens from thirteen different seams in English coal fields, Mr. Wills has found that arctic coal possesses very nearly the same composition.

PROTECTION OF IRON SURFACES BY FORMATION OF BLACK OXIDE.

Professor Barff stated that a perfectly adherent and coherent coating of black oxide which will protect iron from corrosion may be formed as follows: A wrought iron muffle, containing the iron articles to be operated upon, is heated to a dull red heat, all the openings closed, and dry steam turned in. The muffle is kept filled with steam for from three to five hours. The fire is then raked out, and the articles are allowed to become black in an atmosphere of steam. After this the steam is turned off, and the muffle and its contents are allowed to cool slowly. The temperature to which the muffle is heated varies according to the nature of the articles operated upon, from 662° to 1,292° Fah.

IMPROVEMENT IN MANUFACTURE OF BETON.

BY JOHN C. GOODRICH, JR., OF NEW YORK.

In the method now employed of making béton or concrete, cement and sand are used without previously preparing the cement. In the Coignet methods sufficient water only is added to make a plastic pulverulent paste. This does not contain sufficient water to form hydrates, unless lime enters largely into the composition, in which case the moisture held by the lime is taken up by the cement during its crystallization, the lime absorbing its moisture from the air; but lime in a large quantity weakens the béton, from having but a low adhesive power in comparison with cement. Neither is it able to withstand the action of water or fit for underground work, as it does not become hard when kept constantly damp, nor does it become hard in the interior of large monoliths when it is removed from the effects caused by the atmosphere.

In the other and ordinary methods a larger quantity of water is used, sufficient to make a semi-liquid mass that will flow. This excess of water is forced out of the concrete by the contraction of the cement during its crystallization, and leaves the stone porous. It also prevents the proper ramming of the béton, and gives rise to the difficulty known as "*laitance*," hereinafter described. On the other hand, a béton containing too little water becomes friable.

My process is as follows: When, in the construction of large monoliths or structures, largely underground, the checks and efflorescence which usually appear are not a serious objection. Sand and cement may be mixed in the proportion of from three to six parts of sand to one of cement. This may be done by means of machinery or by hoes, shovels, and rakes. During this process water is added by means of a hose or watering pot having a rose jet. The water is added gradually until the sand and cement contains so much that a handful of béton will, if tightly squeezed, allow a little water to exude, but will, when laid down, still retain the impression of the hand. The béton so mixed will have about the consistence of melting snow. It can be compacted in the same way, and pressure will force the moisture out of it. This condition, though difficult to describe, is learned at sight by the workmen, and the correct amount of water is more accurately gauged by trying the béton from time to time in the hand during its mixture (as it varies in different cements) than can be done by any rule of measurement. The béton is then placed in position and rammed, as described below.

The quantity of water thus gauged will be enough to form hydrates, in combination with the components of the cement, leaving no excess to be forced out during crystallization, and does not prevent the proper ramming of the béton, while there is not sufficient to cause *laitance*. But to obtain a perfect result where a finished surface is requisite, and to make a béton free from the deleterious ingredients that are found in all cements, and to insure the use of a proper quantity of water, I proceed as follows: Having obtained the heaviest slow-setting cement, the first step in this process is to separate from it the light, earthy impurities—the uncombined lime and clay and the soluble salts. This can be done to a considerable extent by a regulated current of air being driven against the cement while falling from a height, and in a proper inclosure; or it can be done by revolving screens, or by means of a centrifugal mill; and I claim these methods to be equivalents of the following. But the method which I prefer, and recommend as much more perfect, is to allow the cement to fall slowly into a box filled and constantly fed by a stream of water, the entrance of which is preferably near the bottom of the box. One side of the box is lower than the others, for the overflow of the water. Where a constant stream of water cannot be had the result may be obtained by agitating the cement with water in a swinging box or other convenient way, pouring off the water and supplying its place with fresh water from time to time.

A box may be placed in and on the bottom of the larger box to collect the cement as it settles. The portion thus preserved consists of the heavy, gritty, and inactive parts of the cement, which is without adhesive power, and which acts simply as so much sand. This equals about ten per cent of the whole mass of cement.

Cements containing a larger amount than usual of this gritty portion may, when mixed pure, stand a high test, but will not bear a large admixture of sand. With this gritty part settles the true cement, which we call the "matrix." This is that portion which is capable of crystallization or hydro-silicatization called "setting." This portion of the cement is the only one of value, and is about 80 per cent of it.

The third or lighter portion, which is washed away with the overflowing water, consists of impurities, light earthy matter, uncombined lime and clay, and soluble salts. This portion of the cement is entirely without adhesive power, and, when separated from the other portions of the cement, acts in all respects like the impure and dirty clays. When dry it shrivels and contracts, and when wet expands and becomes slippery. This portion of the cement is the cause of the unsightly checks, and what appear to be cracks, but which are simply projections of this earthy portion, which, by its own action in contracting and expanding, and the crystallization of the cement, has become separated from it. With this earthy portion the alkaline salts, consisting mainly of soda and potash, escape. This is the portion that causes the efflorescence or white appearance on the stone as heretofore made, and also what is known as *laitance* on concrete laid in water.

The light, earthy, and soluble portions having been removed from the cement, the supply of water is turned off, and it is all allowed to escape from the wash-box.

The cement, freed from its deleterious portions, and being thus saturated or supplied with the proper amount of water, is thoroughly mixed by machinery, or by means of shovels, hoes, or rakes, with clean, dry, sharp sand, in the proportions of from three to six parts of sand to one of cement, according to the strength desired.

The béton thus mixed is rammed into position, layer by layer, with a pounder, having knobs or projections to make an irregular face. The irregularities made by the pounder on the top of the layer leaves it much the better bonding of the succeeding layers.

During the process of ramming and compacting, large stones of suitable shape to form a good bond may be put into the mold or mass, and the beton rammed around and between them, the stones not being allowed to come in direct contact with each other. This gives stronger work, and allows more thorough ramming and the use of larger stones than where in the usual way broken stone is mixed with the sand and cement before being put into the mold or mass.

The phenomenon of *laitance* is one of the gravest difficulties besetting the laying of concrete under water. It is caused by the impurities hereinbefore set forth. When the concrete is mixed in the ordinary manner, so as to form a semi-liquid mass, these impurities rise to the top of the layer in position, gradually subside and deposit an unctuous stratum. Thus between each layer of the concrete is interposed a slippery layer, utterly preventing any union or bond between the layers of concrete, and very seriously impairing the solidity and strength of the structure. The former of my processes prevents this, since the béton is sufficiently dry to prohibit any movement of its component parts. The second modification of the process prevents it for the same reason, and because the impurities forming the *laitance* are themselves eliminated.

Inventions Patented in England by Americans.

From August 21 to August 27, inclusive.

ELEVATORS.—C. Baldwin, Brooklyn, N. Y.
MOTIVE POWER ENGINE.—F. M. Townsend (of Memphis, Tenn.), Liverpool, England.
PLUMBERS' TRAPS.—J. E. Folk, Brooklyn, N. Y.
RAILWAY SWITCHES.—J. S. Williams (of Riverton, N. J.), London, Eng.
SPRING BEDS.—W. Peacock, New York city.
STEAM ENGINES.—G. B. Massey, New York city.
STOPPERS.—N. Thompson (of Brooklyn, N. Y.), London, Eng.
SURVEYING INSTRUMENTS.—H. Wadsworth, Duxbury, Mass.
UMBRELLAS.—W. H. Richardson, Philadelphia, Pa.
WIRE-DRAWING MACHINERY.—J. S. Winsor, Providence, R. I.

NEW BOOKS AND PUBLICATIONS.

ON THE SCIENCE OF WEIGHING AND MEASURING. By H. W. Chisholm, Warden of the Standards. Illustrated. Macmillan & Co., London and New York. Price $1.50.

This is a capital treatise written by one who is *ex-officio* an authority on its subject. The scope of the book includes the following general heads. Definition of weight and measure; ancient standards of weight and measure; English standard units of weights and measures; the restored standards, imperial standard pound and yard; secondary imperial standard; derived units of imperial weight and measure; the metric system, and weighing and measuring instruments and their scientific use. There is an abundance of valuable information gleaned evidently at the cost of industrious research, the engravings are many and good, and the work in all respects is fully up to the latest progress.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED COMBINED DIVIDER AND SIDING HOOK.

Homer Sherman, Flushing, Mich.—The object of this invention is to furnish for carpenters an improved tool that combines the advantage of a pair of dividers and of a siding hook with a marking knife scale, bevel square, etc., forming a simple and handy implement for cutting and marking boards in siding and wainscoting. Ths invention consists of a siding hook having a straight back and a fixed point, in combination with a pivoted divider leg. The tool may be used as common dividers, or for setting off bevels and squares, by a swinging leg, when the straight back of the siding hook is placed against the edge of the board, or it may also be employed in siding, as dividers, hook, and marking knife may be used at will, and for wainscoting, and for other applications in carpentry.

IMPROVED PLANTER AND MANURE DISTRIBUTOR.

John Real, Double Springs, Miss.—This invention relates chiefly to the use of a harrow which is so arranged as to cover the cotton seed, and is also made vertically adjustable at its front end. Cultivating plows may likewise be easily attached place of the harrow.

IMPROVED PERFORATOR FOR PRINTING PRESSES.

James A. Carruth, Topeka, Kansas.—This invention consists in providing the frisket finger of a printing press with perforating teeth. The perforator is triangular in cross section, and is provided with a cutting edge that is serrated and with a square end piece, through which a hole is bored for receiving a bolt that secures it to the nipper frame. The perforator

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moves with the nippers, and when the platen presses the paper against the face of the type it also forces it against the serrated edge of the perforator which is backed up by the furniture of the chase. The paper is thus punctured along the line upon which it is to be separated, and the holes are more or less numerous, according as the serrations in the perforator are coarse or fine. The invention consists of a knife-like piece of metal with a serrated or notched front or broad back, for perforating paper so that the latter may be easily detached from a stub after binding, or for perforating tickets so that they may be easily detached from each other. The serrated edge is constructed with the perforators twice the length of intermediate notches. The perforator is engaged by a piece of furniture in the form, which presses and drives the serrated edge into the paper.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED WATER CUT-OFF.

John G. Diem, St. Francisville, La.—This invention has reference to improvements in the cut-off for conducting the water from the roof either to the waste pipe or cistern, so as to first cleanse the water of dust, soot, etc., and then conduct the pure rain water to the cistern, and when the same is filled again to the waste pipe. The invention consists of a cut-off of circular shape, having conical supply and exit pipes, separated by a tapering partition, in combination with a centrally swinging semi-circular gate, that connects the supply pipe with either discharge pipe. The inner end of the supply pipe is of conically-tapering shape, while the discharge pipes are separated by inclined walls, that form a sector-shaped body, which extends into the cylindrical main body nearly up to the center. A centrally pivoted gate, with semi-circular side walls, is carried by the outer handle end of the gate pivot from one half of the body to the other, so as to bear on one side of the supply pipe and rest on the correspondingly inclined partition wall, conducting thus the water from the supply pipe to the waste pipe or cistern, as required, without leakage or choking, as the semi-circular space of the main body serves as a kind of regulator, and produces the even discharge of the water. The cylindrical shape of the cut-off imparts to the same a lighter and neater appearance, and renders the same more effective and reliable in use.

IMPROVED FLYING TARGET.

Edwin M. Leavitt, Auburn, Me.—This invention has reference to an improved flying target, which is to be shot at and used as a substitute for the wild pigeon sprung from a trap; and the invention consists of a supporting stake with an adjustable barrel having slots and a spring trap arrangement for shooting the dart-shaped target. The barrel may, by means of the stake and socket, be adjusted at any direction and angle, so as to throw the target high or low, or to the right or left, as desired. The stake is, however, driven into the ground, and the barrel clamped so thereon that the catch to which the releasing string is attached is placed toward the shooter. The target is made in the shape of a dart, with a slitted stick of wood or metal and detachable wings of paper, pasteboard, or other material, cut in any desired form. The wings of the dart-shaped target present to the shooter a full target, let it turn as it will. By pulling back the crosshead of the spring and retaining the same by the catch and inserting the target, the device is ready for use. By pulling, then, the string the target is thrown out by the spring so as to be shot at. The stick or carrier of the target may be made of spring pieces that are held by a sliding ring, or when made of steel this ring may be dispensed with, and the ends first bent inwardly, so as to be readily lifted for taking out the torn wings and inserting new wings.

IMPROVED STOVEPIPE ELBOW.

Greene Choate, East Saginaw, Mich.—The object of this invention is to cut the section of which the elbow is composed from a rectangular piece of sheet metal without wasting material or incurring the labor of trimming the sections after they are cut from the sheet. Another object of this invention is to place the seam of the elbow at the side of the same, instead of at the bottom, so as to prevent the pyroligneous acid or soot, which usually accumulates in stovepipes, from exuding or oozing out, there being no seam at the bottom of the pipe for such a result to take place. Blanks for the sections of four-piece elbows, as ordinarily cut, require trimming after being cut from the sheet, to give them the required curvature. The end sections of the elbow also require trimming, so that one end of the elbow shall be small enough to enter the pipe to which it is placed, and the other end of sufficient size to receive the small end of a length of pipe. A sheet of metal is cut on three similar but oppositely arranged curves. Each of these curves is composed of two arcs of equal radius. The sections cut upon these reversed curves require no trimming, but are ready to be at once formed into an elbow. The central portions of the elbow are secured together by rivets, and inside of the lines in the section the holes are made for receiving a rivet that holds the smaller end of the elbow together, and outside of the lines in that section the holes are made for receiving the rivet that holds the larger end of the elbow together. By cutting the blanks as above described, the seams in the elbow section are placed at the sides of the same, instead of at the bottom, thus preventing the pyroligneous acid from passing out. By this invention the blanks are cut in such a manner as to make the proper difference in the ends of the elbow sections, to allow one end to receive the other, this being done by making the taper half in each section only, thus avoiding all trimming and effecting a great saving of time.

IMPROVED UMBRELLA.

William S. Harris, Brooklyn, N. Y.—This invention relates to certain new and useful improvements in umbrella handles, and consists in making the handle with a taper, the same being either hollow or solid, and providing the same with a suitable spring attachment at the upper or thin end of the handle, which will fill and hold the runner firmly when the umbrella is raised. In order to provide for the runner fitting the upper or thin end of the handle, a bow spring is supported between two ferrules, which have wires extending between them, so as to assist in filling up the barrel of the runner, and thus form a bearing for it equal in diameter to that part of the handle on which the runner rests when the umbrella is closed. On the bow spring there is a catch, which allows the runner to be raised; but when above, it will hold the runner, so that it cannot return until the spring is compressed by the user. It will be observed that the umbrella handle is not weakened, as those at present made are, by slitting the handle for the insertion of the spring. Consequently a stronger stem or handle, much neater in appearance, and capable of being made smaller in size, owing to no part being cut away, is produced.

IMPROVED WATERCLOSET.

Francis E. Kernochan, Pittsfield, Mass.—The object of this invention is to improved the construction of watercloset in such a way as to prevent the escape of sewer gas and enable the supply of water to be regulated and controlled as may be required. The water pipe rises above the basin of the watercloset and opens into a reservoir, placed at a suitable distance above said basin. From the reservoir an outlet pipe leads down to the basin, passes in through the bottom of said reservoir, and rises nearly to its top. An inlet or water pipe enters the reservoir near its top. In the side of the outlet pipe, just above the bottom of the reservoir, is formed a hole of about half the area of the inlet pipe, so that when the water is admitted a part of the water will flow out through the hole and outlet pipe into the basin, and the rest of the water will tend to fill the reservoir. Should the valves be kept open sufficiently long the reservoir will be filled, and after that the water will flow out through the pipe as fast as it enters through the water pipe. The difficulties that may arise from the varying supply of water at different places, or at the same place at different times, may be met, either by the use of a self-filling tank controlled by a floating bulb, as at present used, or by a valve connected with a separate pipe used to supply the after-wash, so that that pipe shall be always closed when the inlet pipe leading to the reservoir is open, and open when said inlet pipe is closed, so that the only entrance of water to the basin while the lifting rod is raised will be through the overflow pipe in the reservoir, and after the lifting pipe is lowered through the after-wash pipe.

IMPROVED ADDING MACHINE.

Marshall M. Smith, Kirksville, Mo.—This invention is intended to combine the advantages of an adding machine and paper weight in a cheap, neat, and convenient manner, it being reliable and durable in use, and operated with accuracy and dispatch. It consists of fixed disks with circumferential sliding and toothed rings, and of a movable units and tens disk, operated by a thumb wheel and interior shaft, and by a sliding and eccentrically pivoted catch lever. A fixed arm with pointer or index end extends from the supporting standards, and carries a small end pinion, that is turned by each revolution of the adjoining sliding ring by a fixed lug at the zero point for one tooth, and moves the next ring forward thereby. The machine is operated in the following manner: The sliding rings are turned until the zero points connect with each other, and with the pinion and fixed stop of arm, so that the pinion will stand in 1 and the stop of the first sliding ring in line with the pointer. The revolving wheel and catch lever are then turned by the thumb wheel until the catch lever forms contact with the stop piece of arm, when the wheel is turned in opposite direction and the catch lever drawn in so as to take along the first ring band until the first figure to be added appears on the revolving wheel in line with the pointer. The catch lever and wheel are then turned back to the stop piece, and turned forward again until the second number appears thereon, and so on, the catch lever moving the first band and the first band moving automatically the pinion, and thereby the second sliding band, and so on, the sum total of all the numbers being finally read off at the pointer, being in line therewith. The addition of different numbers is thus accomplished mechanically in neat, quick, and accurate manner, without the least chance of making mistakes. In setting the bands it is only necessary to set the band indicating the 100 and 1,000 with the finger, as the units and tens band may be set easily and readily by the wheel and catch lever.

IMPROVED HOG TRAP.

Thomas C. Weaver and Harvy V. Weaver, Kenney, Ill.—The object of this invention is to furnish an improved apparatus for catching and holding hogs and stocks while being marked, branded, or having other operations performed upon them, and which shall be simple in construction, convenient in use, and effective in operation, catching the animal readily and holding it securely. It consists of a rectangular frame, the top and bottom bars of which are grooved or slotted to receive the upper and lower ends of the slides. The outward and inward movements of one slide produce corresponding outward and inward movements of the other slide. In using the device the door or gate is raised and the animal is driven into the pen, where it is secured by lowering the said door or gate. The slides are then moved a little apart, the animal puts his head through between them, when they are moved together, so as to clamp his neck and hold him until the desired operation has been performed upon him.

IMPROVED ADJUSTABLE SUPPORT FOR LAMP REFLECTORS.

Richmond Henry, Glassborough, N. J.—The object of this invention is to provide an adjustable frame for attaching a reflector to an ordinary lamp or gas burner. A ring, having an adjusting screw, by which its size may be varied, is fitted to any ordinary lamp collar or gas burner. Loops are attached to the sides of the ring for receiving wires which are bent twice at right angles to form a rectangular frame, which is inclined at such an angle as to bring the reflector supported by it into the proper relation with the flame of the lamp or gas burner. A socket, which receives the shank of the reflector, is drilled to receive the ends of the wires, and is provided with a set screw, which retains the shank of the socket in any position into which it may be turned. The reflector thus mounted is capable of turning in any direction within certain limits.

IMPROVED BOILER FOR HEATING WATER UPON OIL STOVES

Robert E. Killip, Brooklyn, N. Y.—This invention relates to kettles in which to boil water; and the object is to obtain a very large amount of heating surface in a comparatively small space. The nature of the invention consists in a boiler which is constructed with a skirting that is extended into and below its bottom, in combination with tubes which pass through the skirting and part of the water space, and project from the interior surface of the skirting. Below the body, tubes are applied to the skirting, and arranged around it equidistant from each other. These tubes may be cylindrical or tapering, and they all project inside of the skirting a short distance, for the purpose of slightly arresting the outwardly escaping heated products, and utilizing as much of the heat as possible. The boiler is used by arranging it over the lamps of an oil furnace; or a common oil lamp may be applied inside of the skirting, when it will be found that comparatively little heat will be required to boil water in the body.

IMPROVED HEATING STOVE.

Alfred H. Chase, Dowagiac, Mich.—This invention relates to improvements in heating stoves by which the fuel is economized, a larger percentage of the heat supplied to the rooms, and the sweating of the stovepipes and chimneys prevented. The invention consists of a stove connected by a direct draft pipe with the outside of the room or building, and by a pipe branching off from the same with the stovepipe, the pipes having suitable dampers to keep up a draft in the stovepipe and chimney and carry off smoke, while confining the heat in the stove. A stove of an suitable construction may be used, to which cold air is supplied from the outside of the room or building by a draft pipe that passes through the floor and prevents the taking up of any of the heated air from the room. The heat in the room is thereby preserved, and no extra fuel required for reheating the air drawn off. The air is drawn by a pipe into the stove below the grate, and the stove thereby made independent of the atmosphere in the room. A draft pipe is connected with a cold air pipe which branches off from the same below its opening into the stove, and below is a damper. The cold air pipe is extended below the stove, and then in upward direction to the stovepipe, entering the same above the damper of the stovepipe. The cold air pipe is also supplied with a damper near its upper end, which is closed when the current of air is to be thrown entirely into the stove for keeping up a brisk fire therein. By changing the dampers the fire may at any moment be restored to the required briskness, so as to keep it up when supplying coal, and without drawing off any of the heated air of the room.

IMPROVED METALLIC SEAL.

William W. Johnson, Nashville, Tenn.—The bows or shackles of metallic seals have been usually constructed of several strands of wire twisted together in such manner that the bows have a comparatively smooth exterior, and, in consequence of such construction, they may be withdrawn from the lead ball without injuring it materially, thus destroying the practical efficiency of the seal. It is the object of this invention to provide a metallic seal whose bow or shackle, although constructed as cheaply and simply as those previously used, cannot be withdrawn from the lead ball or seal proper without defacing or injuring it to such an extent as to render detection easy. The bow or shackle is formed of a central wire and an outer wire or wires, which are wound spirally around it in such manner as to leave a considerable interval of space between the respective convolutions, thereby forming a composite wire screw with widely separated threads. The ends of the bow or shackle thus constructed are inserted through the holes previously formed in the lead ball, and the latter being compressed sufficiently to close said holes and cause the lead to set firmly around the wire screw, the latter will be held so tightly that it cannot be withdrawn without seriously defacing or mutilating the ball, and thus disclosing the fact that the seal has been tampered with.

IMPROVED BRACELET, ETC.

Charles H. Graef, Edgewater, N. Y.—This invention has reference to improvements in that class of rubber, horn, and other articles which are made with a natural spring, so as to return to their normal position on being applied, the improvement being intended to embellish said articles without weakening them or detracting from their ready use; and the invention consists of a bracelet, child's long comb, or other article of springy nature, having a broken-out ornamental band of suitable metal attached at the ends only, so that the band gives on spreading the article, and resumes its snugly fitting position on the article without getting torn and without injuring the article. An elegant ornamentation for such articles that return to the natural position by the spring of their material is thus furnished, which is not detrimental to the articles themselves, nor damaged by the working of the same, so that thereby the more general use of such articles is promoted by the improved appearance of the same.

IMPROVED WOOD-SAWING MACHINE.

John A. Chandler, Monticello, Iowa.—A treadle is pivoted to the sawhorse and attached to a frame which extends beyond the treadle, and to which the saw frame is pivoted. Stop pins are arranged for preventing the saw from dropping too low and from being thrown too far back. A spring is attached to the frame and to the saw frame for drawing the latter downward, so as to cause the saw to bear upon the wood supported by the horse. To the inner end of the treadle a spring is attached, which strikes a buffer spring at each downward stroke of the treadle. A lever pivoted to the crossbar at the back of the horse, and provided with a curved serrated dog or holder that engages the surface of the wood being sawed as the lever is drawn forward. The operation is as follows: A stick of wood is placed upon the horse and the treadle is oscillated with both feet, while at the same time the upper end of the saw frame is grasped by one hand and the lever which clamps the wood by the other. The wood is thus quickly sawed with very little exertion.

IMPROVED ANIMAL TRAP.

Chauncey M. Orton, Glen's Falls, N. Y.—The box of the trap, which is rectangular in form, is designed to be made of tin, so that animals cannot eat their way out. This box is divided into two compartments by a partition that slides in grooves in the sides of said box. In the partition, near one side, is formed an opening of such a size that the animal trapped for can easily pass through it. The trap is set by drawing up a sliding partition. The animal, in roaming about, sees the bait upon a wire, and in seeking to reach it enters the box, steps upon the platform, and withdraws the wire from the door, which allows said door to drop. The frightened animal, seeking to escape, passes through the opening in the partition to the bridge, which tilts under his weight, and he passes through the opening in the plate into the inner compartment of the trap, and is securely caged. The descent of the bridge raises the door, which is caught and held by the wire, and the trap is reset, the bridge returning to its normal position as soon as the animal has passed from it.

IMPROVED LIFTING JACK.

Samuel Barrow and David Barrow, Windfall, Ind.—This invention relates to lifting jacks which are designed for raising stumps, wagons, broken down fences, and for rolling logs, and all purposes where heavy objects are to be moved. A strong standard has a base secured to it which is adapted to receive and guide a vertically movable lifting bar, and also to receive between its open cheeks the end of a lever, which is constructed with an enlarged head, having a fulcrum pin fixed eccentrically to it, and this lever is connected to the lower bifurcated end of the lifting bar by means of a bent link. The edges of the cheeks of the standard are notched to receive the ends of the fulcrum pin, and to allow the lever to be adjusted higher or lower, as may be desired. An arm is adjustable independent of the plate or bar, and is used for raising fences and supporting them while being repaired or straightened. When it is desired to use the jack for rolling logs or turning heavy beams, the plate is detached from the jack and the cant hook is attached to the lifting bar by inserting the straight portion into the hole in the upper end of this bar.

IMPROVED FIRE ESCAPE.

Thomas A. Andrews, Gainesville, Tex.—The object of this invention is to provide a simple and inexpensive fire escape that cannot get out of repair, and that is always ready for use. In the pulley stile of a window frame is formed a receptacle for the rope and strap of the fire escape. This receptacle is provided with a door, which, when closed, forms a part of the stile. The hinges upon which the door swings are each provided with a stop, which prevents the door from being accidentally closed. The door serves the double purpose of closing the receptacle and of a bracket for supporting the pulley and rope of the escape. A grooved pulley is journaled in a casing that is secured to the door. This casing prevents the rope from slipping from the pulley, and also from becoming knotted or twisted. The strap is attached to one end of the rope, and is provided with a snap hook or buckle, by which it may be adjusted. The rope is of such length that both ends may touch the ground. The manner of using the escape is as follows: The window is raised above the door, which may then be opened, and when open it extends beyond the wall of the building. The person desiring to descend places the strap around the chest under the arms, and drops the free end of the rope to the ground. The escape may be operated by persons below or by the person descending. The person escaping steps out of the window, and either lowers himself or is lowered by persons from below. One person may in this manner lower a number of people. The apparatus may be placed in the wall of the building, either inside or outside, but it is most convenient when arranged in the window frame, as described.

IMPROVED FAUCET.

Thomas A. Andrews, Gainesville, Tex.—The object of this invention is to provide a faucet which is inexpensive in its construction, easily repaired, and efficient in operation. The body of the faucet is L-shaped, and contains a passage which is enlarged, forming a valve seat, and is threaded internally to receive a screw. A lateral oblong aperture is formed in the body just above the valve seat for the escape of liquid from the faucet. The inner end of the screw is provided with a square projection, to which is fitted a packing disk, of elastic material, which is secured to the screw by another screw. The screw that closes the faucet is provided with a handle or thumb piece, by which it may be turned, and the body of the faucet is provided with a tapering portion, which may be driven or screwed into the vessel or pipe in connection with which the faucet is used. The advantages claimed for this improved faucet over others now in use are that it may be more cheaply manufactured, is more easily repaired, and is perfectly secured against leakage.

IMPROVED BEE HIVE.

Aaron Deardorff, Joseph W. Stutzman, and Aaron D. Stutzman, Morrisonville, Ill.—The object of this invention is to furnish an improved beehive, which shall be so constructed as to give the operator full control over his bees, and which, at the same time, shall be simple in construction and convenient in use. The front, sides, and top of the hive are permanently attached to each other, and the back is separate, being hinged at one end to adapt it to serve as a door. Bars are permanently attached to the lower parts of the sides of the main hive and may be folded in beneath the rear parts of the brood chamber, or may be turned outward to form a way for the brood chamber to be slid out and in upon. The front and rear parts of the brood chamber are permanently secured to its bottom at their lower edges, and are rabbeted upon the inner side of their upper edges to receive the projecting ends of the top bars of the comb frames, and the projections formed upon the corners of the side boards of the said brood chamber, which projections may be the projecting ends of cleats attached to the upper edges of the said sides. The sides of the brood chamber are so formed as to fit snugly between the front and rear of said chamber. This construction enables the sides of the brood chamber to be moved in or out, to adjust the size of said chamber, as may be required. The comb frames are kept at the proper distance apart by staples attached to the side edges of their top and side bars.

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Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Skinner Portable Engine Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

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More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years constant use prove them stronger and more durable than wrought iron. See advertisement, page 206.

Emery Grinders, Emery Wheels, Best and Cheapest, Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Notes & Queries

(1) T. M. S. asks how "tube white" in artist colors, is made? A. Precipitate a solution (in water) of barium chloride by addition of dilute sulphuric acid in excess. Decant the liquid after the precipitate has subsided, wash the precipitate well with water, dry it, and finally grind it with a small quantity of fine oil.

Please give me a recipe for waterproofing a blanket? A. Boil 4½ ozs. of white soap in 2½ gallons of water, and separately dissolve 5¾ ozs. of alum in 2½ gallons of water. Heat these two solutions to 190° Fah. and pass the goods once through the soap bath, and afterwards through the alum solution. Lastly, dry it in the open air. The alum causes the precipitation of an insoluble alum soap within the fiber.

(2) R. J. says: Will powdered coke cemented together do for the carbon rod in a Leclanché cell? What kind of cement shall I use? A. The carbon is ground fine, mixed with gas tar, pressed into form, and baked at a strong heat. The pores are filled by dipping in the tar (sometimes molasses is used in place of the tar) and rebaking. This is often repeated 4 or 5 times.

(3) L. J. asks: What will take out the stain left by common gunpowder, where it has been blown into the skin? A. It can often be removed by blistering the parts, but this is painful, and does not always succeed.

(4) G. S. says: 1. The conductivity of copper is said to be 100, that of iron about 16 per cent. Does that mean that a wire of iron, six times as large as copper wire, offers the same resistance (to electricity) as the copper wire? A. Yes. 2. Would dipping common fence wire into hot coal tar protect the wire from rust? A. Yes, for a time; depending on the conditions of exposure, etc. 3. Would the tar impair the conducting qualities of the wire? A. No. 4. I wish to prepare two miles of wire for telegraphing. What is best to protect it from rust? A. Coat with boiled oil or good asphaltum dissolved in naphtha or turpentine.

(5) T. A. J. asks for a recipe to clean ivory knife handles that have become colored by use? A. Try bisulphide of carbon and whiting or pipe clay.

Also a recipe to make solder for a Britannia teapot? A. Tin, 8 parts; lead, 4 parts; bismuth, 1 part. Melt at a moderate heat and run into bars.

(6) T. J. P. asks if rubber hose burned in a firebox is injurious to the steel or iron of which it is made, as in a fire engine for generating steam quick? A. Yes, the sulphur it contains will corrode the metal. Unvulcanized rubber would not prove injurious.

(7) W. E. asks: 1. What is the Jablockhoff electric candle? A. See No. 22, p. 339, vol. 36, of the SCIENTIFIC AMERICAN. 2. Does it require a battery? A. The candle is supplied with electricity from a powerful galvanic battery or magneto-electric machine.

What is kaolin? A. Kaolin is a pure white clay—such as is used in the manufacture of porcelain ware.

(8) W. B. K. asks: 1. Does the solution of 1 lb. of tungstate of soda in 3 gallons of warm water prevent wood from decaying as well as render it fireproof? A. Yes, to a certain extent, if properly applied. 2. If not, what will prevent the decay of beams, joists, etc., in buildings? A. Solutions of zinc chloride, sodium sulphate, water glass, pyroligneous acid, carbolic acid, and corrosive sublimate have been used. The latter is poisonous. 3. Is the tungstate of soda solution simply to be applied with a brush? A. It is better to saturate the wood as far as may be with it—it should be used hot. 4. If so, will you inform me how to estimate the cost both of material and labor in rendering all the wood fireproof that would be required in building a large wooden house? A. You can best determine this by experiment—it will probably require not less than a pound for every hundred square feet of surface. 5. If the solution applied as a wash is not sufficient for the purpose, how long should the wood lie in a bath of the same? A. If the wood were dry and the solution hot, ordinarily half an hour would suffice. 6. Is there any firm in the country, to your knowledge, from whom fireproof wood can be purchased? A. We do not know of such a firm. 7. Which is the better way of making black mortar for brickwork, to use anthracite coal dust instead of sand, or to mix a sufficient quantity of ivory black with the sand? A. The latter. 8. Which stone trims the walls of a large country house built of pressed brick, to better effect, the brown stone so common here, New York, or the light yellow stone? A. This is a matter of taste. The brown stone is, we believe, generally preferred.

(9) G. A. P. asks: 1. How can I make a good electric light by means of a galvanic battery? A. Connect fifty or sixty quart cells (of a Bunsen or Grove description) in series—that is, the carbon or platinum pole of one to the zinc of the next, and so on. Bring the conducting wires—one from the free pole at each end of the series of elements—to the lamp. This may be of the kind known as "Jablochkoff's candle" (described on p. 339, SCIENTIFIC AMERICAN, vol. 36). When the wires are properly connected to the lower ends of the carbons in the candle, and a small pea of carbon or lead is thrown between the upper ends of the same so as to establish communication, the current passes, and the electric arc appears—the lead or carbon being burned. 2. How many batteries would I need, and what would be the cost? A. About sixty large-sized carbon cells, costing about 75 dollars. 3. In making an electric light, would I have to have an induction coil? A. No. 4. Also how calcium lights are made? A. Oxygen and hydrogen—or coal gas—are caused to mingle in a very small, stout chamber, situated near the tip of a suitably curved jet. The mixed gases, as they issue from the jet, are ignited, and the flame caused to impinge upon a small cylinder of hard lime, which thereby becomes heated to incandescence. The gases are kept under pressure in large rubber bags or iron cylinders, and are conducted thence separately by rubber tubing to the jet. 5. How much would one cost? A. The cost of apparatus for the light is about fifty or sixty dollars.

(10) S. L, C. asks how to make parchment paper? A. Strong unsized paper is immersed for a few seconds in oil of vitriol diluted with half its volume of water. It is then washed in pure water or weak ammonia water. The acid solution must not be warmer than the surrounding atmosphere.

(11) J. C. G. asks: Is the accumulation of carbonic oxide gas, in wells, sudden or gradual? A. Gradual.

(12) P. McG.—The scale insect infesting he orange trees of Florida seems to be *aspediotus citricola*. For information on orange blight in Florida see Packard's "Guide to the Study of Insects."

(13) E. G. asks for a recipe for preparing wax for modeling? A. Mix lard with white wax to make it malleable. It may be colored any desirable tint with dry color. In working, the tools and board or stone should be moistened with water to prevent its adhering.

(14) W. T. R. asks: 1. Whether the offensive odor, in the spring of the year, arising from the ailanthus tree is detrimental to health? A. Such has not proved to be the case. 2. What is the best season of the year to destroy the tree? A. It is a difficult matter to destroy them completely at any time; perhaps the latter part of October would prove most favorable.

(15) P. M. B. asks: What is the cheapest application or process to retain the polish on steel plates in a damp room? A. Oil or a thin transparent varnish is often used. The polished surfaces on machinery, stored or in disuse, are often protected by coating them with a mixture of tallow and white lead.

(16) J. J. asks: 1. Which is the most improved magneto-electrical machine? A. Probably the Gramme machine. 2. Where can I get a full description and illustration of the same? A. See pp. 181, 195, vol. 34, SCIENTIFIC AMERICAN, and No. 17 of SCIENTIFIC AMERICAN SUPPLEMENT. 3. When was it patented? A. We believe the first patents were secured in the year 1873. 4. How large a machine would it require to completely decompose one gallon of water in five hours? A. One using about thirty horse power would probably do this, the water being acidulated. 5. How does acidulated water compare with pure water for this purpose? A. Acidulated water is generally used; its electrical conductivity is very much greater than that of pure water. 6. How many revolutions per minute does it require to obtain the best possible results and the most powerful current? A. This depends on the size of the machine. Usually with as great a velocity as compatible with the safety of its parts. With the two or three horse power machines about 250 revolutions per minute give good results. 7. Upon what conditions does the efficiency of a magneto-electrical machine depend? A. When properly constructed, mainly upon the rapidity with which the bobbin wires pass through the magnetic field, the number, size, and arrangement of the bobbin wires, and the power of the magnet.

(17) R. E. R. asks for a cement for aquariums? A. Take 10 parts, by measure, of litharge, 10 parts of plaster of Paris, 10 parts dry white sand, 1 part finely powdered rosin, and mix them when wanted for use into a stiff putty with boiled linseed oil. This will stick to wood, stone, metal, or glass, and hardens under water. Do not use the tank until three or four days after it has been cemented.

(18) C. A. R. says: In a discussion on optics the question was asked why we could not see through fog. A. said it was on account of polarization of light. B. said it was because the top part of the fog up in the air acted like a mirror and reflected the rays of the sun. C. said it was refraction, that is, the fog was a prism, and bent the ray so we could not see, being able to see only in straight line. A. A. has the correct idea.

(19) J. B. F. asks for a recipe for making koumiss? A. As made by the Calmuck Tartars, mare's milk is distilled as it is undergoing fermentation.

(20) C. P. W. asks: Is there anything cheaper than alcohol that could be successfully used in a common blowpipe lamp: A. No.

(21) J. H. asks what greenheart wood is, such as fishing poles are made of? A. Greenheart is a tree belonging to the laurel family. It is found in the West India Islands and in parts of South America. The value of the wood is in great strength and hardness.

(22) A. I. asks how to anneal old saw blades? A. Heat carefully in a forge, fire to a dull red heat, and while hot imbed in wood ashes or air-slacked lime until cold.

(23) J. B. S. asks for a preparation for polishing turned work in the lathe; says he has used bleached shellac and sweet oil, but it takes too many applications and time to produce the desired finish. A. Dissolve gum sandarac in alcohol in proportion of 1 oz. of the gum to ½ pint of alcohol. Shave fine in 1 oz. of beeswax and dissolve in turpentine sufficient to make a paste. Add to the dissolved sandarach. To use, apply with a woolen cloth to the work while running in the lathe, and polish with a soft linen rag.

(24) H. C. B. asks what to use to paint the smokestack of a portable engine that is exposed to the weather, to prevent its rusting? A. Dissolve asphaltum in turpentine with the application of a gentle heat. Use when cold. Apply with a brush.

(25) I. W. D. asks how to thin printing ink so as to distribute even on pads? A. Mix with boiled linseed oil or common kerosene and grind with a muller or a pallet knife on a painter's slab.

(26) W. T. B. asks: Will it hurt a steam boiler to use corn cobs for fuel? A. No.

(27) E. O. K. asks for a method of coloring wall plastering before it is put on the wall? A. Wet the coloring material, if in powder, with alcohol, then mix with the water with which the mortar is made.

(28) J. D. B. asks: Shall I use nitric or sulphuric ether to dissolve rubber? A. Ethylic—commonly called sulphuric—ether is the kind. To be of use as a solvent for gum rubber (it does not dissolve vulcanized rubber) it must be quite free from alcohol and water. Ether of requisite purity is often difficult to procure. Pure ether boils readily at the temperature of the hand.

(29) L. A. B. asks: What time of the year is best to cut branches to make rustic work? A. Late in the autumn.

(30) E. B. asks: How is it that opticians will give eyepieces with telescopes warranted to magnify 100 or 150 diameters, when the magnifying power of a telescope varies with every object whose distance varies? A. Opticians do not usually focus their telescopes on objects to determine their focal length. Whenever they do, it is on a small star; this is the nearest to parallel light and may be considered as such. The focal length of a telescopic objective is computed for light entering parallel; it is in this condition that the eyepiece is said to have a certain magnifying power, but it is the combined magnifying power of both objective and eyepiece. Some use the dynameter, which gives the magnifying power at once without being obliged to know the focal length of any of the lenses.

(31) W. J. R. asks: Is a circular saw, made for sawing logs into lumber, made concave on one side? A. No.

(32) R. I. T. asks for a process for refining beeswax, and how to tell pure wax from the adulterated? A. Melt the wax with a little water in a vessel heated in a water bath or by steam, and after boiling a few minutes withdraw the heat and sprinkle over its surface 3 or 4 fluid ozs. of oil of vitriol to every 100 lbs. of wax. Care must be exercised in applying the acid, as the wax is liable to froth up and run over the sides of the vessel. Cover over and leave for two or three hours to settle. Carefully skim and decant the clear portion. Pure beeswax burns without smoke or smell. Its complete solution in bisulphide of carbon and benzine demonstrates its freedom from sulphur, sawdust, or bone dust. Spermaceti may be detected by the wax bending before it breaks, and by its flavor when chewed. Rosin may also be detected by the taste. When greasy matter is present in any considerable quantity it may be detected by an unctuous feel and by a disagreeable taste. Chalk, plaster, etc., will subside to the bottom of the vessel when the wax is melted, owing to their superior gravity.

(33) W. F. T. asks how to prepare glue to use cold, also what can be added to make glue pliable when dry? A. Prepare the glue with alcohol and acetic acid instead of water. To make glue pliable and glycerin or molasses.

(34) J, N. S. W. asks (1) for a method of straightening a rifle barrel? A. Gun barrels before they are rifled are straightened by observing peculiar shadow lines in the interior of the barrel, which are a guide to the workman. After the barrel is rifled, these lines cannot be seen. Some gunsmiths draw a fine black silk thread through the barrel and observe if it touches the barrel alike through the interior. 2. How to blue parts of a gun, such as the lockplate, etc.? A. To blue the parts of a gun, first polish the parts and then burnish them with a steel burnisher. Put them in an iron box containing powdered charcoal or wood ashes and heat over a forge fire until by observation the parts are of the desired color, then remove and let them cool.

(35) J. B. I. asks how to cut a lamp chimney lengthwise? A. If the shape of the chimney precludes the use of a diamond, a small thin copper wheel, such as used by glass engravers, charged with sharp gritted sand and water, will accomplish it.

(36) H. G. asks how to bronze gun barrels, also the best protection of guns from rust near the seashore? A. Mix 1 oz. each of nitric acid and sweet spirits of niter, 4 ozs. powdered blue vitriol, 2 ozs. tincture of iron, and water ½ pint. Agitate until dissolved. Polish the barrel and rub with powdered lime or whiting to remove all grease. Stop up breech and muzzle of the barrel with wooden plugs made long enough to handle the barrel by. Rub the solution on evenly and put in a warm place to dry until the next day, when rub off the coating produced by the solution with a wire brush. Repeat the process of wetting, drying, and rubbing off until the desired color is produced. When this is the case, wash in pearlash water and then in clear water. The best protection for guns when exposed to the influence of a sea atmosphere is to rub them over with mercurial ointment.

(37) H. F. C. asks: Does it produce a physical or chemical change in a knife blade to magnetize it? A. No.

(38) E. P. L. asks: What is the method employed to detect bad eggs? A. Hold the eggs to the light, encircling them with the thumb and fingers. Good eggs show transparent, but the bad ones are opaque.

(39) W. & S. say: 1. We are engaged in the manufacture of cast steel mould boards for plows. In hardening them they often crack. What is the remedy? A. Over heating in forging will often cause steel to crack in hardening. Another trouble is hardening them in water that is too cold and having the steel at a high heat when so hardened. Careful forging in working use water that is a little warm in hardening are the remedies. 2. Can they be casehardened, and if so, how? A. Pack the work in an iron box, filling all the space around the work with fine bonedust, or burnt leather reduced to a powder. Be careful to press the bonedust or leather tightly around the work, and see that the surfaces of the work do not lie in contact. Cover the box and lute with clay so as to be tight. Heat in a brisk fire until the box and contents are heated to a red heat, and keep so for one quarter or one half hour, then remove the cover of the box and empty the contents into water. If too hard, the temper may be drawn in same manner as hardened steel.

(40) M. A. J. says: If a nut on an old bolt cannot be started with a wrench, cut into each side of the nut with a dull cold chisel, holding a sledge on the opposite side, and the cutting will stretch the nut enough so that it can be readily turned off.

(41) J. M. asks if there is any such thing as a mineral plumb, used by men prospecting for gold or silver? A. No.

(42) J. Q. R. asks for a rule for the standard horse power of steam boilers? A. There is no standard for the horse power of a boiler that is generally recognized by engineers.

(43) S. E. S. asks: 1. What mixture is used for making blackboards? A, Incorporate flour of emery or powdered pumicestone with shellac varnish, adding sufficient lampblack to give the required color. Ap-

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ply to the surface to be coated with a fine flat brush. It is better to apply two coatings. 2. What kinds of wood are best for the boards? Good clear white pine, well seasoned.

(44) C. B. asks: 1. What constitutes the calorimeter of a boiler, and how is it measured in connection with the grate and heating surfaces? A. It is the area for the passage of the products of combustion from the furnace to the chimney. In case this area varies throughout the run of the gases, it is usual to take the smallest area for the calorimeter, since this limits the supply of air, and by consequence the rate of combustion. 2. What kind of steel is it that is generally used in making connecting, piston, and valve rods, etc., of steam engines? A. Both cast steel and semi-steel are used.

(45) C. R. P. asks: Can a press be made to work with compressed air instead of water? We are using an hydraulic press. It requires refilling with water quite often on account of rust from the tank getting under the valves. In case an air pump could be made to work, how much longer would it take to run it up with air than it does with water? A. Air could be used, but in the majority of cases that occur in practice water pressure is preferable. The time required to run up the ram would depend upon the dimensions and arrangement of the apparatus.

(46) J. H. asks: Will you give me a rule for finding the latitude and departure of a course when the distance and bearing are given? A. Latitude= length of course×cosine of bearing. Departure= length of course×sine of bearing.

(47) D. McR. says: I have a force pump which works well for a short time when it is primed. Valves seem to be in perfect order and airtight. A. There is probably a leak, either in piston, suction valve, or suction pipe.

(48) E. M. B. asks: Which is the most economical in the use of water in supplying a boiler, an injector or pump, allowing the evaporation to be the same? A. There is not a great deal of difference so far as can be judged from the few comparative experiments that are accessible.

(49) A. H. C. asks: 1. In sea-going steamers, which is the most efficient, a screw propeller or paddle wheels? A. The propeller. 2. How do paddle wheels compare with the screw in smooth water? A. Well designed wheels compare favorably.

(50) P. J. M. asks if the lock gates in any canal are opened by machinery, or some motive power, such as steam? A. The machinery for opening the lock gates of the Des Moines Rapids Canal is operated by hydraulic power.

(51) G. D. asks for a wood filling, for filling the grain of wood to be varnished? A. Mix magnesia with shellac varnish.

(52) Apprentice asks how to cast a joint? A. If it is a pivot joint, cast the socket part first; ream out the socket; wash it with plumbago and fine charcoal, and then run the pin part into it. (If you run the pin half first and run the socket around it, the latter is apt to shrink and split). By working the parts together the wash will be rubbed out.

(53) J. E. T. says: If two steam radiators of equal size and under the same conditions are painted, one black and the other white, which will radiate the most heat? This depends upon the pigment used. A. The radiation from surfaces coated with lampblack and white lead are about the same.

(54) W. H. B. says: I wish to use a core of wood within a steam pipe, leaving an annular space around the same, between core and the walls of the pipe. This space will be filled with steam during about half the year, and air during the other half of the year. What will be the life of the wood? A. Make the core of well seasoned wood, and it will probably last you several years.

(55) P. S. asks: Will it do to have a stream of oxygen gas blow through an alcohol lamp flame, used for melting small glass rods? A. There is no objection to the use of oxygen other than that of expense.

(56) C. D. asks for a recipe for an axle lubricant for heavy vehicles? A. Take 5 parts beef tallow, and 1½ or 3 parts of graphite, pulverized (black lead of commerce), mix while warm. This is for summer use. For winter, use lard in place of beef tallow.

(57) L. R. asks how to soften brass work? A. Heat it red hot and cool suddenly by plunging in cold water.

(58) R. C. L. says: In using heaters for steam boilers where the water is heated nearly or quite to the boiling point, and the force pump refuses to work, what is the remedy, supposing the pump to be in good order, and would work all right with cold water? A. It is necessary to allow the vapor to escape. For successful working under such circumstances, it is well to deliver the water to the pump under a head somewhat greater than the pressure of the vapor.

(59) J. O'B. asks how large a boiler to make for a small engine with cylinder 1½ by 2½? A. 11 inches diameter, 15 inches high.

(60) W. C. T. asks how to construct a cremation furnace? A. In vol. 30, p. 295, of the SCIENTIFIC AMERICAN is given cut and description of such a furnace.

(61) A. R. C. asks for a finish or polish for sheepskin colored linings? A. Varnish with the white of eggs and finish by rubbing with a burnisher.

(62) J. R. P. asks: 1. If a drop of nitric acid should be dropped on an ounce of nitro-glycerin dynamite, or dualin, would it cause them to explode? A. Probably not. With nitro-glycerin, however, the force of impact of concussion might be such as to cause an explosion. 2. Which of the three named would be the most powerful? A. Nitro-glycerin is the more powerful. 3. Suppose a person should be placed at the extreme height of the atmosphere, how would he be affected? A. Immediate death from rupture of the blood vessels and asphyxia would ensue.

(63) Constant Reader asks what effect inhaling the fumes of naphtha has on persons who use it? A. It attacks and deteriorates the mucous membrane.

(64) J. W. G. asks: What books can I get that will inform me how to construct furnaces for small steel castings and for malleable iron castings? A. You will find information on the subject in standard works on metallurgy.

(65) P. B. asks for a cement for mending harness or other leather? A. Take common glue and American isinglass equal parts. Put in a glue pot, and add water sufficient to cover, and soak about ten hours. Then bring to a boiling heat and add pure tannin until the mass becomes ropy or like the white of eggs. Scrape the leather where it is to be joined, apply the cement warm, rub the surfaces solidly together, and let the work remain undisturbed till dry. The leather must be free from grease or oil.

(66) A. B. C. asks for instructions how to stain marble? A. Apply color in solution to the stone when it is heated sufficient to make the liquid simmer on the surface. For blue, use an alkaline solution of indigo; for brown, tincture of logwood; for crimson, a solution of alkanet root in turpentine; for yellow, tincture of gamboge or turmeric; for red, tincture of dragon's blood, alkanet root or cochineal; for green, a tincture of sap green, or stain first blue, then yellow; for gold color, a mixture of equal parts of white vitriol, sal ammoniac and verdigris, all in fine powder.

(67) A. G. R., of Canada, asks for instructions in raising sumac and preparing the leaves for market? A. The roots may be planted at about six feet apart. It will flourish in either low or upland. The leafy tops are broken off and dried in the shade. When dry they may be beaten with sticks or flails. The gathering of the leaves may commence in July and continue till frost. It may be packed in bags, preparatory for shipment to market. The amount of tannin contained is from fifteen to twenty per cent.

(68) J. B. W. asks for a preparation to mix with black (printer's) ink, to print designs on tin, one that will dry readily? A. First give the plate a very thin coating of light colored copal varnish, and, if necessary, add a little fine Japan dryer to the ink. The printing plates may be of vulcanized rubber.

(69) W. W. W. asks how to make glass fusible? A. By addition of excess of lead oxide and alkalies, glass can be made so as to fuse readily in an ordinary furnace.

(70) Drummer asks how to make parchment for drumheads? A. Remove the wool from sheepskins, steep them in lime, stretch on a wooden frame, and scrape with a knife. If any greasy matter remains steep again in lime. If the surface is uneven or of unequal thickness, rub it down with pumicestone.

(71) T. W. O. asks: Is there a substitute for alcohol in the making of transparent soaps? A. Use methylic alcohol—wood naphtha.

(72) W. F. R. & Co. ask how to re-color green bronze French statuary that has become broken? A. Dissolve 1 oz. sal ammoniac, 3 ozs. cream of tartar, 6 ozs. common salt in 1 pint of hot water; add 2 ozs. copper nitrate in a pint of hot water. Mix well together and apply with a brush to the parts repeatedly.

(73) G. R. asks: 1. What is celluloid and how is it made? A. Celluloid is a kind of solidified collodion. It is composed of some fiberous material, such as cotton, which is dipped in sulphuric and nitric acid. The cotton then possesses the quality of solubility and sudden explosion, and is termed gun cotton or pyroxylin. When this is dissolved in ether and alcohol it is called collodion, and is used in photography. Celluloid is made by using camphor in place of alcohol and ether, in connection with pyroxylin. The pyroxylin is ground to a pulp with water. It is then strained to expel the water, and pressed into a mass. Gum camphor is ground with water and thoroughly incorporated with the pulp, one part, by weight, of camphor being used to two parts of the pulp. The mass is then put in a mould and subjected to powerful pressure, and heated while under this pressure from 150° to 300° Fah. 2. Is this the article used in the manufacture of artificial ivory, billiard balls, etc.? A. Yes. 3. Is not gun cotton, the same as that used by photographers, one of its constituents? A. Yes.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. F. L.—No. 1 is pyrites in trap No. 2 contains clay, oxides of iron, lime and magnesia. No. 3 is a piece of greenstone with adhering clay colored by iron oxide.—G. P.—No. 1 is principally of hornblende schist with some oxide of iron. No. 2 is pyroxene, with oxide of iron and clay.—I. J.—It is quartz rock—it is not of value.—Lyman, London, Eng.—The sample contains copper, iron, antimony, and sulphur. We do not know of a substitute for alcohol in the varnish—wood spirits (crude methylic alcohol) might answer.—D. S.—It is asbestos—it is found in nature as a mineral. We do not know that there is any patented method for dressing it.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Striped Water Snake. By C. F. S.
On Fire Escapes. By J. C. M.
On a Simple Sash Button. By H. J. N.
On the Skull of the Domestic Fowl. By C. F. S.

Also inquiries and answers from the following:

D. A. S.—F. C. S.—V. M. M.—J. S. A. B.—E. S. B.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who deals in wood prepared so as to resist decay? Who makes clay-grinding machines that will grind small stones at the same time the clay is being ground? Who makes machinery for rolling iron? Who manufactures silver card board? Who makes a light spring power suitable for running sewing machines?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 21, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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DESIGNS PATENTED.

10,157 and 10,158.—PATTERN IN SUITINGS.—Nathan Frye, Andover, Mass.

10,159.—BRACELET.—J. Hackenberg, New York city.

10,160, and 10,161.—CENTER PIECE.—S. Kellett, San Francisco, Cal.

10,162.—ADVERTISING BALLS.—Edwin E. Sage, Chicago, Ill.

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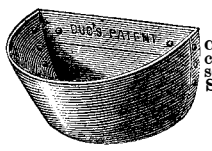

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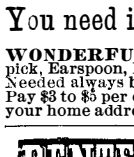
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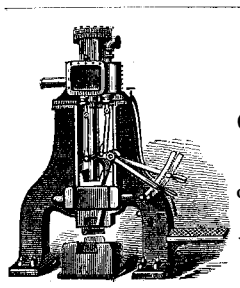
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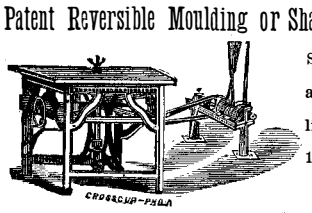

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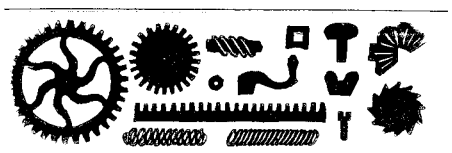
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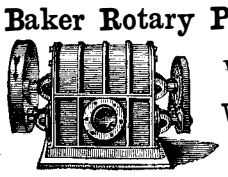
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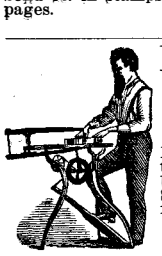
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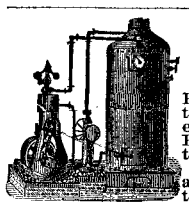

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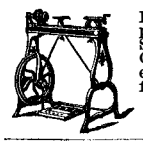

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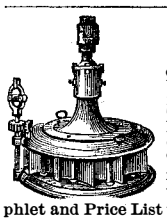

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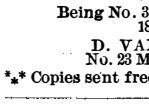

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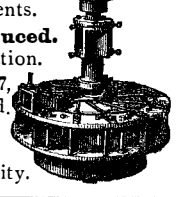

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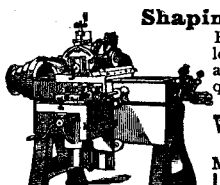

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